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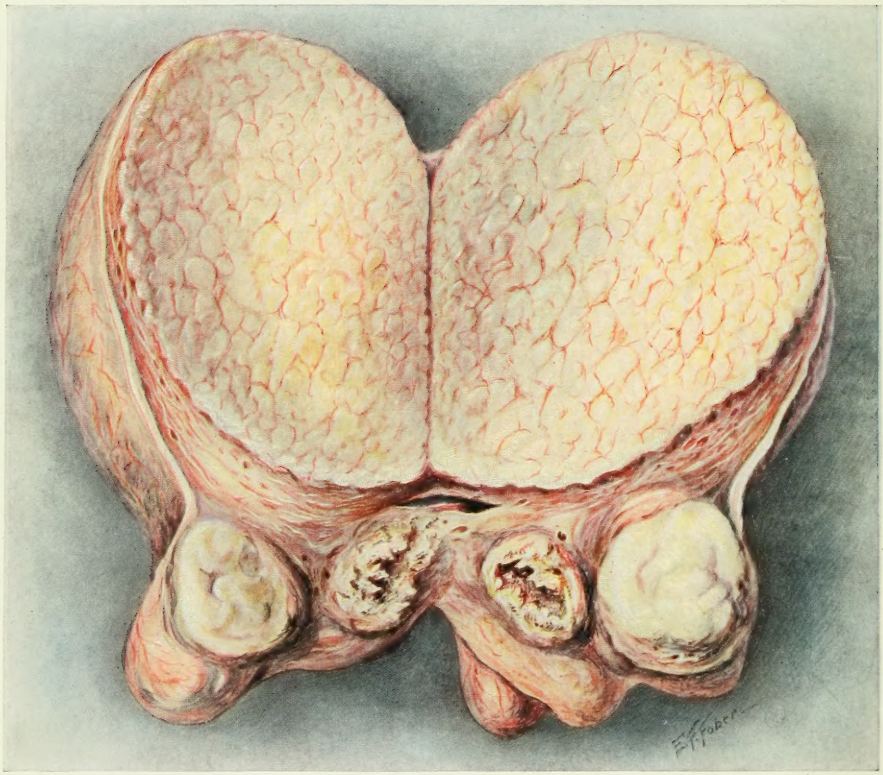

Fibroid of the uterus, associated with early carcinoma. (Markedly reduced.)

[*Page 203.*

INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIATRICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS, PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY, OTOLOGY, RHINOLOGY, LARYNGOLOGY, HYGIENE, AND OTHER TOPICS OF INTEREST TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION THROUGHOUT THE WORLD

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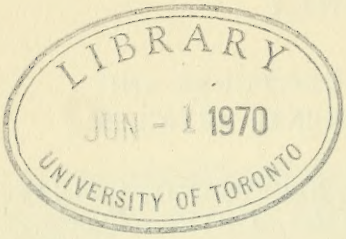

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Diagnosis and Treatment

ABDERHALDEN'S BIOLOGICAL DIAGNOSIS OF PREGNANCY

BY PHILIP F. WILLIAMS, M.D.

Assistant Surgeon, Maternity Dispensary, University Hospital, Philadelphia

During the past few years the attention of the entire medical profession has been drawn to the new biological or serum diagnosis of pregnancy as proposed by Emil Abderhalden, of Halle. Naturally, the interest of obstetricians and gynæcologists immediately awakened to the diagnostic value of such a procedure, and, in practically every maternity and gynæcologic clinic, more or less work has been done in investigating the problem of this blood reaction in pregnancy, cancer, and allied pelvic conditions. Workers in other fields of medicine have adapted the method to their problems, and, consequently, abundant literature on the subject is available.

The test is based on the assumption that the presence of a foreign proteid in the blood-serum causes the development of a ferment or enzyme capable of splitting or cleaving this foreign proteid. As is well known, during the process of digestion the gastro-intestinal ferments break down the ingested albumin masses with the various changes to peptones and, finally, amino-acids, in which form the blood stream carries nourishment to the individual body-cells. Here the amino-acids are used as building stones to replace the waste material created during the metabolic activity of the cell. However, should some proteid substance be introduced into the blood stream without having undergone the action of the gastro-intestinal ferments, as by direct intravenous injection, or parenterally, a reaction takes place in the blood, with the development of enzymes or ferments capable of splitting or reducing the injected material to a form capable of assimilation by the body-cells.

In pregnancy, as has been repeatedly demonstrated, cells of the chorionic villi invading the muscular wall of the uterus are broken off and are carried into the maternal circulation. Here the defensive reaction takes place with the formation of protective ferments to clear the blood of these masses of foreign elements. To demonstrate the presence of these ferments Abderhalden prepared a peptone from the placenta and, by means of the polariscope, showed a splitting of the peptone by the serum of a pregnant woman. The action of the ferments was shown by a difference in the degree of rotation of a ray of transmitted light after the mixture of serum and peptone had been incubated for a certain period of time.

The dialyzation method, which is in use at the present time by practically all observers, depends upon the property of diffusion of crystalloids through a vegetable membrane. Albumin, being a colloid, does not pass through such a membrane, but, if acted upon by a proteolytic ferment, is reduced to peptone or amino-acids, which, being crystalloids, are diffusible and pass through the membrane. The presence of amino-acids in the water surrounding the diffusion shell or parchment membrane, after the period of digestion, can be recognized by appropriate tests. To obtain a suitable albumin for the pregnancy tests a newly-delivered placenta is obtained, washed free from blood, and cut in small pieces. It is then boiled until no trace of soluble proteids is found in the wash water by using the biuret or the newer ninhydrin test. The final product is preserved in chloroform water under a layer of toluol. The diffusion shells are parchment membrane thimbles, the size of the little finger. These shells must undergo certain preliminary tests, to see that they do not leak, that they are permeable to peptones and yet impermeable to albumins. In these preliminary tests the patience of the laboratory worker is sorely tried. The usually small number of shells from each group which survive the tests are stored in chloroform water under a layer of toluol. The blood for the test is collected in a sterile centrifuge test-tube by an aseptic venous puncture. The blood should be collected before breakfast, or at least four hours after meal-time, for reasons to be given later. After the blood has clotted, clear serum is obtained by centrifuging the tube in an electric centrifuge.

An actual test is carried out by placing a piece of the boiled placenta the size of a pea in a tested diffusion shell, 2 Cc. of clear

serum added, and the mixture covered with a layer of toluol. The outside of the shell is then washed under running water and the shell placed in a glass container in which there is 20 Cc. of sterile distilled water. The water outside the shell is covered with a layer of touol and the whole apparatus placed in the incubator for a period of eighteen hours. Certain workers have devised containers which obviate the use of toluol which helps to prevent putrefactive changes. Control tests are made by placing serum alone in a second tube, and placenta alone or with inactivated or heated serum in a third tube. After the digestive ferments have acted for eighteen hours the water in the containers surrounding the shells is tested for the presence of peptones or amino-acids. For this purpose the biuret test was formerly used, but has been discarded, and we use a new color reaction, making use of a new chemical, triketohydrindenhydrat, known under the trade name of ninhydrin. A solution of this chemical, when added to a solution containing amino-acids, gives, upon boiling, a beautiful blue color reaction. So in performing the test a one per cent. solution of ninhydrin is made up, and one-tenth of a cubic centimetre is added to 10 Cc. of the water in the container, the mixture being boiled for exactly one minute. If digestion of the placental mass occurs, with the formation and dialysis of amino-acids, a blue color will develop, sometimes only after allowing the solution to cool. There should be no color developed in a similar test, using the water from the containers whose shells held placenta alone or serum alone.

This brief description constitutes the test as at present carried out. In addition to the controls mentioned, using serum alone and placenta alone, two further sets of shells may be used, in one placing the serum from a known pregnant woman, and in the second set using serum from a known non-pregnant person. Among the errors most likely to occur are the presence of hæmoglobin, a diffusible proteid, in the serum; this dialyzing gives the same color reaction and obscures the correct interpretation of results. The placental material may have undergone autolysis with the formation of certain cleavage products which are dialyzable; for this reason the placenta, or substrata, as it is now termed, should be retested before using. The development of leaks in the shells during use and storage should be guarded against, and the greatest care is necessary in the preparation of glassware and in the handling of material to prevent bacterial

contamination. As would be expected, many refinements and modifications of the original technic have been suggested, all tending toward greater accuracy in performing the test.

Apart from pregnancy, the test has been used mostly in investigating the reaction of the serum in cases of carcinoma and various mental conditions. It has also been used in the study of certain infections, tuberculosis and syphilis, and such general diseases as anæmia and diabetes. In our work at the University of Pennsylvania we have obtained varying and conflicting results. In the study of pregnancy cases a positive reaction was always obtained, but serum from cases of infections, and occasionally sera from normal non-pregnant individuals, gave a positive reaction when tested against placental material. It was also found that the ferments in the serum of a pregnant woman were able to digest the albumin prepared from other tissue than the placenta, which would seem to show that the ferments possessed at times a general proteolytic power.

A review of the work of many observers must convince one that there is as yet a difference of opinion as to the specific nature of the test. True, a large number of cases are reported in which there is not a single discrepancy between the laboratory and the clinical findings, and yet, on the other hand, workers just as skilled have reported a considerable number of failures between the results of their laboratory work and the operative findings, or the presence or absence of pregnancy as determined by the subsequent development of the case. It has been proposed that many of the positive results found on using sera from non-pregnant cases may have been due to removing blood at the height of digestion when the circulation is normally loaded with the amino-acids resulting from natural processes, and that the positive results obtained in some conditions, as the cancer cachexia, high fever, and tuberculosis, may be due to the presence of excessive amounts of broken-down cells. As regards adverse findings when other substrata, as cancer tissue, is subjected to the action of pregnancy serum, or when, for instance, kidney tissue is subjected to the action of serum from a person with a severe infectious disease and positive results are obtained, the theory is advanced that there may have been several ferments developed at the same time, due to a complex pathology, and that they have a selective action. Again, we find that a group theory is advanced to explain the digestion of bovine placenta by human preg-

nancy serum. Here it is contended that the placental cells performing a similar work in each species have such a close relationship that they may be used interchangeably as substrata.

Lately some investigators working with a view to determine the exact nature of the ferment have decided that the splitting of the albumin is not due to a ferment action, but to a cytolytic property developed in the serum. This cytolytic ability of the blood-serum has been recognized before, and, should the point raised be proved by them, it will undoubtedly refute completely the protective ferment theory as elaborated by Abderhalden.

As regards the results obtained in studying pernicious vomiting, eclampsia, and the various other toxic conditions of pregnancy, the test has shown conflicting results in the hands of various workers. The majority apparently agree that there is a diminution or absence of the ferments in these conditions, as shown by the weakness or non-appearance of the color reaction. This would seem to offer a support for the successful serum therapy, of Freund and Mayer, of the toxæmias of pregnancy. Their treatment consists in the injection of large amounts of the serum from healthy normal pregnancy cases, either intramuscularly or intravenously, into patients suffering with various forms of pregnancy toxæmias, and this has been generally followed with uniformly good results.

In view of our own work with the pregnancy test and the frequently obtained positive results in alien conditions, we would consider a negative result as having more value than a positive reaction, although the clinical findings should be taken into account.

Notwithstanding the large number of observers reporting adversely, yet in view of the amount of work being carried out along this line of research at the present time a final verdict as to the practical value of the test must be held in abeyance.

PAINLESS CHILDBIRTH OR SEMI-NARCOSIS IN OBSTETRICS

BY DANIEL LONGAKER, M.D.

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The subject of painless childbirth has recently been given such a large share of attention in journals and even in daily papers, and the information has been so greedily assimilated by the public mind, that there has been some danger of the laity outdistancing the profession in knowledge of methods and details of securing that end so much to be desired—the abolition of pain in parturition. More recently eminent specialists have given their evidence before this jury of the public, and in so many cases such hasty and unfair opinions have been expressed that a very valuable procedure, as I intend to show, may fall into unmerited disfavor. At first eagerly grasped at, later feared, what now shall be the sane mature judgment regarding scopolamine-morphine or hyoscine-morphine, or the later combination of scopolamine-narcophine in obstetric practice?

It is quite to the point to consider the necessity of enlarging our list of pain-obtunding agents, but these are so well and so popularly known that their enumeration is not necessary. Manifestly, they have failed to fill the indications, either through infrequent or inefficient use; and hence the clamorous demands from our patients for something better.

The following incident serves to show the mental attitude of at least a small part of the public. "When our daughter marries and has a child, she, too, shall go to Freiburg," said the wife of a prominent gynæcologist, in a large neighboring city, after reading the McClure article. "No, indeed," he replied; "she shall have the treatment right here." And he told me three months ago that he had kept at least fifteen women from going to Freiburg. The very last applicant, finding that Dr. —— was going to Europe for the summer, and that his alternate in another city was going, too, promptly declared her decision of going to Freiburg to have her baby there. No

one in all the States to take care of her and give her what she thought she had a right to demand! I am sure all of us have not at all times given a ready ear to appeals for relief from pain, and we have thus often been blind both to our own interests and the ultimate welfare of our patients.

INDICATIONS FOR THE NEED OF "PAINLESS CHILDBIRTH"

It is not a unique experience to be called to a patient for an operative delivery when the immediate results for both infant and mother are infinitely better served by delay. The one supreme element to overcome many a case of dystocia is time. But to secure this necessary time in the face of personal, family, and sometimes community hysteria is no easy matter. Attending physicians, and even consultant, often yield unwisely to the demands of the patient and friends, and thus an attempted early operative delivery ends either in failure, in serious or even fatal injury to the child, and in physical trauma to the woman herself. A delay of four, six, eight, or more hours, as a rule, converts such apparently difficult cases into the simplest possible, from a mechanical point of view—the questionable high forceps operation becoming the easiest low forceps, feasible even in the hands of a tyro.

I have recently had under my care a case in point, where slight disproportion had led to an attempted high forceps operation, followed by abdominal cæsarean section. The patient had recovered, finally, after seven months' treatment in various hospitals and an additional section. A few months ago she came under my treatment and passed through her second labor at term under the influence of scopolamine-morphine semi-narcosis. She would have delivered herself spontaneously; but, fearing the effect of prolonged expulsive effort on her uterine scar, I delivered her instrumentally (low forceps) of a large baby. Her letter is an interesting personal testimonial, which I greatly prize.

In addition to resulting physical traumata, and perhaps more important in many cases, are the psychic effects and the nervous shock of prolonged subjection to really severe pain. Consequent neurasthenia persists, often long after the physical injuries are mended, or it may be the only bad result of what is, to the patient, the most terrible ordeal of her life.

While morphine and chloral and bromides, either alone or in combination, have long been used to tide our patients over hours of necessary waiting, there are two or three drugs which have been proved to possess a peculiar sedative effect on the higher psychic centres. Under the influence of these, the power of memory is lost, and impressions, seemingly definitely registered, are forgotten. Patients have been taken to the hospital, operated on, and returned to their homes, and, on regaining full waking consciousness, they have stoutly maintained that they have never been away from home. It is this peculiar power of scopolamine and hyoscine, first suggested by von Steinbüchel, that makes the use of these drugs peculiarly valuable in obstetric practice. Memory of the sense of pain being abolished, one prominent cause of neurasthenia is removed, and, likewise, the natural dread of having another child.

TECHNIC IN USING THE DRUGS

Here I desire to express my obligation to Holt for his masterly exposition of the Freiburg method as developed by Gauss and Kroenig. Careful perusal of this article[1] will enable one to avoid a few pitfalls, and comparison of this paper with Professor Kroenig's[2] recent utterance before the Chicago Gynæcological Society will serve to show a very consistent adherence to all the essential details of the original plan as evolved about ten years ago.

Kroenig says,[3] "The entire technic depends on the dosage." Enough is given to establish *semi*-narcosis (a term preferable to all others because of its definiteness); and, by fine gradations of the dose, the amount required for the individual case is determined early. By careful tests of the ability to observe and remember, not only the amount originally required is determined, but also the time for the repetition of the dose and the quantity necessary to maintain this state of *semi*-narcosis, and not full narcosis, is established.

The initial dose, consisting of morphine-hydrobromide, $\frac{1}{6}$ to $\frac{1}{8}$,

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[1] William L. Holt, "Scopolamine-Morphine in Obstetrics," *American Journal of Clinical Medicine*, vol. iv, 1907, pp. 566–577.

[2] Geheimrath Professor Doctor Kroenig, "X-ray and Radium in Gynecological Diseases," *Surgery, Gynecology and Obstetrics*, vol. xviii, May, 1914, pp. 529–535.

[3] *Ibid., Surgery, Gynecology and Obstetrics*, p. 531.

and scopolamine, $\frac{1}{150}$, is given when the pains have become really severe and when they last thirty seconds at least, and when they are recurring every five or six minutes. The patient is placed in a semi-darkened room, unmolested by any member of her family and under the constant direct observation of the physician himself, or an assistant. A reliable, competent nurse is essential; and it must be understood that the patient cannot be left even for a moment. At the time the injection is given the patient is told that she will soon feel sleepy, and she is encouraged to go to sleep. Forty-five minutes later she is questioned regarding the first injection and about details of her case. Finally, special test objects are shown her, which she is requested to remember. It is a good plan for the nurse to record the incidence of each pain, either by a pencil stroke or by indicating the time as the minutes pass by. Likewise, the duration of individual pains should be noted. Long observation has proved to me that this plan, carefully followed, is of more importance, prognostically, than digital examination. Thirty to forty-five minutes after the second injection the patient is again questioned: "How many times was the needle used?" "What objects do you remember?" "In what order were they shown you?" "What time is it?" "What special attention in the way of treatment did you have?" If her memory is definite, she needs another dose of scopolamine; if she fails to remember, no more is given. At the end of an hour or two her sense of memory is again tested. As it returns she is again given what is, for her, the required dose. In order to attain a more accurate and easy method of grading the dose, I have had made up a solution containing $\frac{1}{2}$ milligramme scopolamine-hydrobromide to 1 Cc. Kroenig advises 0.45 milligramme as the size of the first and the second doses.

So long as the patient fails to remember, no more injections are given, and only as the *ability to forget is lost* are they repeated. The cry of the patient is no index of the sufficiency or insufficiency of the dosage. Here I desire to acknowledge one of my errors. In a paper read some time ago before a local society I mentioned especially the facility with which one could suppress the noise of the semi-crazed parturient by the use of these drugs. To quiet her often means overdosage and full and not *semi*-narcosis.

Owing to individual peculiarities, temporary excitement sometimes follows an excessive dose.

CAUSES OF FAILURE

1. *Insufficient Dosage.*—Insufficient dosage and failure to keep up the required effect by injections at too long intervals will result in hops, skips, and jumps of remembering and forgetting alternately, which have as their chief disadvantage that the whole process of labor will be reconstructed in the patient's mind and she will deny having slept at all, though her attendants have seen her sleeping and heard her snoring again and again. She forgets that she was asleep, and thus the main object of the plan is missed—the obliteration of the memory of the pain of this trying time.

2. *Injections Too Near the Time of Birth.*—Ideal results can only be obtained by having a sufficient space of time from the first injection to the termination of the labor. This ought not to be less than four hours.

3. *Overdosage.*—A very prominent cause of failure that deserves special mention is the use of the ready-made compound tablet, which invariably means excessive dosage. Overdosage, together with the failure resulting from injections too near the birth, I will discuss fully under the "Dangers" of the use of scopolamine-morphine.

4. *Improper Surroundings.*—Is the hospital or the home to be preferred? While twenty-seven of the total eighty-five cases of which I have record were treated in hospitals, I do not consider the hospital a *sine qua non.* Indeed, most hospitals afford a poor environment on account of excessive noises, the cries of other parturients, crying babies, excessive or badly placed light. They offer, too, a poor environment if previous trials of an unsuccessful kind have served to make the nursing and the resident medical staff skeptical or antagonistic. Under such circumstances, one of my patients fell off the delivery bed and narrowly escaped serious injury. Needless to say, she awoke. Contrary to express and specific orders, she had been temporarily left by her nurse. The advocates of other and better methods of securing painless delivery will hardly offer the possibility of such an incident as an objection to the method. The accident was one which should not have occurred, and yet, in spite of it, the patient, a nervous old primipara, is well satisfied with the result.

In order to show how easily the plan may be followed in the quiet of a patient's own home under proper conditions, and how

easily a sudden noise or bright light may spoil the effect of the sleep, it is pertinent to introduce here a patient's verbatim account.

"The first hypodermic, given about 11 o'clock, did not seem to materially lessen pain. After the second injection I fell asleep between pains; I thought I had been sleeping about half an hour, but the nurse told me it had only been for 3 or 4 or 5 or 6 minutes, just as the case might be.

"I remember the doctor's showing me something which he said was a case containing needles. Later he asked me whether I had ever seen such a case. Shortly afterwards he repeated the question. I remember seeing the case three times, and answering his questions. He also showed me a pair of baby scales and asked me if I knew what they were. I told him I did. In all I remember three injections being given, and also answering the doctor's questions as to how many injections had been given up to a certain time. The answer was 'three.'

"I remember lying down on the bed in the small room, and my mind is a complete blank in regard to anything that happened between that time and the time when I awoke and found myself lying on the bed in the front room. The electric light was turned on, and I think that roused me. I later learned that it was then 7.20 P.M.

"At 7.45 P.M. the baby was born. After various things had been attended to, the doctor asked me what time I thought it was. I replied, 'About 2.30.' 'Well,' said he, 'It is now exactly 8.30.' I did not understand how I got from one bed to the other, so I asked the nurse, the following day, who carried me over. She told me I walked, but I was unconscious of anything that happened between the time immediately after the third hypodermic injection and the time the electric light was turned on at 7.20 P.M."

While the case so graphically given in the patient's own words is put down in the list of successes, the proximity of a brilliant electric light, in distinct violation of the plainest rules, produced a partial failure. The hammering of an adjacent boiler shop would hardly be more objectionable. A dim light is just as essential as quiet.

The eyes, according to Holt,[4] should be blindfolded and the ears plugged with antiphones.

[4] William S. Holt, "Scopolamine-Morphine in Obstetrics," *American Journal of Clinical Medicine*, 1907, vol. xiv, p. 567.

THE DANGERS OF DRUG NARCOSIS IN LABOR

1. *Overdosage, Resulting in Full Narcosis.*—Study of my records reveals twelve cases in which full narcosis was established through excessive dosage, yet not in a single one of these did the condition of my patient ever excite a moment's anxiety. Occasional cyanosis is always mechanical and implies failure to maintain correct watchfulness. This is the dictum of the Babcock Clinic, where considerable major surgery is done under the full narcosis of scopolamine and morphine. According to my own observations, the respirations are of increased frequency, even in deep narcosis, so long as the patient is kept from swallowing her tongue. I should not hesitate to use the drugs even in heart and kidney cases with high tension and danger of impending eclampsia. In several such cases the method was of distinct benefit.

2. *Dosage near the Time of Birth, Resulting in Oligopnœa.*—Larger doses of morphine than those indicated, or the repeated or single large doses of morphine near the time of the birth, are distinctly perilous to the child, as is well shown by the following: A case of labor in twins; another birth following a version; and, finally, a normal, though hard, labor which occurred slightly prematurely. Thus three infants were lost through lack of observance of one of the fundamental rules established by Gauss long before he had observed his first five hundred cases—now over three thousand.

By way of emphasis, I briefly cite these three cases:

Case I.—Within an hour of the time of injecting morphine-hydrobromide, ¼ gr., and hyoscine-hydrobromide, $^1/_{100}$ gr., I delivered the first one of twins. The patient being multipara, suffering from inertia in the first stages of labor, I brought down a leg and in a comparatively short time the child was naturally born. Its heart-beats were slowed and, though it made several feeble efforts to breathe, it was lost. About one-half hour later the second child was born. It was of similar size and of no greater vigor. Regular respiration was soon established, and it did perfectly well, although, for a time, its survival was doubtful.

Case II.—Not long after this I was called in consultation in a transverse presentation. Version and delivery, within an hour of the time of injecting morphine and hyoscine in similar size doses, was followed by the birth of a baby which could not be resuscitated, although the fetal heart-tones were normal when I arrived.

Case III.—A third fetal fatality occurred under different circumstances. The patient was a II-para. Her first child, an 8½-pound boy, born instrumentally

two years before, was living. Three weeks before full time, labor pains began. After a long first stage I gave her morphine $^1/_4$, and hyoscine, $^1/_{200}$. At the end of forty minutes, her answers showing definite memory and her suffering being quite acute, I gave a second dose of hyoscine, $^1/_{200}$ only. One hour and fifteen minutes afterward (two hours after the morphine) a seven-pound baby was born. Save for the administration of several doses of infundibular extract, the birth was unaided. After the lapse of a few minutes, and when the heart-beats had slowed down and become almost extinct, the child made a feeble respiratory effort. Immediately the heart action improved, but, as regular, automatic respiration was never established, it failed again and again, and finally death occurred at the end of four hours. A postmortem examination failed to show any lesion in the brain, the possibility of which was suspected owing to the severe and frequent expulsive efforts and the prematurity of the labor.

It is very significant that each one of these patients had a larger initial dose of both drugs than the admitted size. In two birth occurred within an hour, and in the last one just two hours after this excessive dosage. Here narcosis was so deep that not only did the patient fail to respond to memory tests, but she failed also to reply to any questions at all for hours, and, indeed, was still under drug influence when attempts to save the baby were finally abandoned at the end of four hours. In my opinion, the potent direct cause of this peculiar failure of respiration—oligopnœa of our German *confrères*—is the excessive and badly-timed dose of morphine, and the attempt to employ the method of semi-narcosis, when there is insufficient time to do so, either successfully or safely.

The very great importance of the matter induces me to quote an early warning voice from Freiburg:

"A child born very soon (within ten to thirty minutes) after an injection of scopolamine is often oligopnœic, and oftener when the scopolamine is overdosed. The child breathes only once, then lies quiet, with shut eyes, breathing occasionally, and cyanotic, and only gradually breathing at lesser intervals, until, at the end of fifteen or twenty minutes, if not treated, it begins to breathe normally. Gauss gives the following interesting description: 'The child opens its eyelids spontaneously, but only to let them fall again slowly as though tired. The width of the pupils varies, so that no conclusion can be drawn as to the depth of the narcotic effect. The following is characteristic of this drunken-like condition: The child reacts strongly to stimuli, but the reflex action of the muscles is often suddenly interrupted before its completion, as though the carrying out of the

movement were suddenly forgotten. Meanwhile, the heart action is clearly dependent on the kind of breathing; after each breath the pulse becomes progressively slower, even to 60 beats, until the next breath, when it at once rises again to normal. This alternation continues repeatedly, at ever shorter intervals, until finally normal regular breathing is established. After this the child shows no further deviation from the normal.'

"How to avoid oligopnœa: This may usually be done by giving only 0.3 to 0.45 mg. scopolamine with 0.01 morphine at the first injection, and only 0.15 to 0.3 mg. scopolamine without morphine later. Of fifty mothers so treated, only five had oligopnœic children, and these five were necessarily given the injections too rapidly: 1.2 to 1.5 mg. scopolamine in two to six hours.

"Gauss had only half as many asphyxiated children in his second five hundred cases, the percentage falling from 12.8 to 6.3; and the mortality was 3.5 per cent. less than during the previous ten years at the Freiburg Clinic." [5]

In conclusion, let me point out various errors of technic to be avoided, best expressed by a series of "don'ts":

Don't use more than one dose of morphine as a rule, or larger doses than 1 centigramme, or, in grains, than $\frac{1}{8}$ or $\frac{1}{6}$. Don't employ the plan when you have too short a space of time. Don't attempt a rapid effect by excessive doses in quick succession. Don't forget that there are better methods (*e.g.*, ether) of meeting the requirements where a quick, short effect must be had. Don't attempt an operative delivery soon after a large dose of the combination of morphine and scopolamine. Don't fail to be governed by the patient's "*Merkfähigkeit*" in determining the size and time of the repetition of the dose. Finally, don't try the Freiburg plan of securing painless childbirth unless you have sufficient time to devote to your patient.

Don't deny that you can make childbirth painless until you have patiently tried and until you have made and corrected your own mistakes. Don't forget that semi-narcosis may be a real boon to womankind and an efficient prophylactic agent whose more frequent use may help to relegate into the background the unlovely, neurotic, comparatively useless mother, one who is falling so immensely short of her own individual and social efficiency.

[5] William S. Holt, "Scopolamine-Morphine in Obstetrics," *American Journal of Clinical Medicine*, 1907, vol. xiv, p. 571.

THE THERAPEUTIC VALUE OF WATER IN PNEUMONIA: A METHOD OF REDUCING MORTALITY *

BY SIMON BARUCH M.D.
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GENTLEMEN:—No disease that you will encounter in practice will tax your judgment and professional skill more than will pneumonia. This truth becomes obvious at once if you consider that in New York City 10,000 deaths from this disease are annually registered, a greater tribute than is exacted by any other malady except tuberculosis.

The importance of water and other physical agents rationally applied is emphasized by clinical demonstration, which proves a decided reduction of mortality when these agents are judiciously utilized.

In my student days pneumonia was regarded as a disease which destroyed life by blocking the lungs with inflammatory deposits. Inflammation was the enemy to be attacked with might and main, and right well did our forefathers battle with the disease. Bloodletting, mercurialization, active catharsis, blisters, poultices, tartar emetic, nauseating expectorants, abstinence from nutritious food, cold water, and fresh air were the weapons marshalled to weaken the enemy. Unhappily these also weakened the patient.

You cannot conceive how helpless those who pursued this practice, even in the milder form taught in the early sixties, were in the presence of a severe case of pneumonia. The efficacy of mercury in "resolving inflammatory products" was regarded as proved in iritis [1] in which their absorption was observable to the naked eye. Other drugs were deemed equally powerful.

The conscientious observer but too often saw his cases of pneumonia dying under this régime. Bad experience impelled us to modify it. We abandoned mercurializing and blistering for inflam-

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[1] It was later discovered that most cases of iritis yielding to mercury were of specific type.

mation, substituted veratrum viride and aconite to subdue the rapid and tumultuous pulse; quinine and whiskey, morphine, and minute doses of antimony became the stock remedies. But still the disease remained fatal.

After the war I learned in the New York clinics from Alonzo Clark, of this school, and others that croupous pneumonia is a self-limited disease, the course of which must not be interfered with unless failure of the natural powers indicate; that it must not be disturbed by heroic measures or drugs. The results, when compared with the spoliative method, were more favorable. That was well enough in hospital practice, but where was the doctor who in private practice would stand idly by and watch nature's cure; where was the patient who would be content to pay the doctor for such inactive neutrality? Few men had the courage to brave tradition and public sentiment. Now the homœopath had his inning in the cities; while he was plying the sick with infinitesimal doses of numerous drugs and dilutions, the conservative powers of the organism were allowed free play. This was the victorious era of homœopaths who in that day scorned to prescribe powerful drugs to subdue pain or to meet other manifestations as many moderns of this school do.

The average so-called allopath continued his calomel, quinine, and small doses of aconite to subdue the inflammation; he calmed the sleepless patient with morphine or chloral; wrapped him in a hot poultice or warm cotton jacket; fed him with milk and broth instead of gruels, and stimulated him when a fatal termination seemed imminent. This was termed the expectant treatment, and expectant it was indeed, in the sense that we expected some complication or failure of the vital powers to turn up at any time, and we expected, too, to be powerless to meet it.

Later, bleeding fell into desuetude, blistering and mercurialization were gradually abolished also, even medication became less active, but the purely expectant method was more honored in the breach than the observance; each leader felt called upon to substitute a more active treatment, especially when the powerful coal-tar preparations came into vogue. Now the solution of the problem seemed at hand. The pulse could easily be controlled by veratrum viride; the temperature could be reduced to nearly normal by antipyretics; pain could be subdued by morphine, and sleeplessness by chloral; strength could

be sustained by concentrated foods, and the vital powers could be spurred to activity by stimulants.

I have briefly outlined this history to furnish you a lesson of therapeutic humility, for, despite the physician's absolute control over every manifestation of the disease, the patients continued to succumb. Despite all our vaunted progress, pneumonia is to-day the most fatal disease, next to tuberculosis. Why is this? The chief reason lies in the disregard of the teachings of history, which clearly show that so long as the *disease* pneumonia was attacked by the physician and the improvement was sought in new remedies to throttle the disease, so long has it continued fatal.[2]

The all-important truth to-day is that croupous pneumonia at least is a self-limited disease which cannot be cut short or cured by any known means. If you will bear this in mind you will reduce its mortality. *The present, like the past, mortality of this disease arises from search for specifics and too active medication with new remedies.*

The lesson I would inculcate is to treat the patient and not the disease, to enhance his resisting capacity, to fortify the patient against toxæmia, as I have counselled you in typhoid fever. In pneumonia the life-and-death processes of the rapidly-multiplying diplococcus evolve certain toxic materials which menace the central nervous system, the heart, and the excretory organs. Bear in mind that this is the chief lethal factor, and not the crippling of the lung. That this is true you may learn by noting the condition of a patient before the crisis ensues, when his life appears to be ebbing away, his temperature high, pulse rapid, face cyanotic, and gasping for breath with distended nostril. All this is changed after the crisis is established. He may be depressed still, but he is not distressed; temperature, pulse, and respiration are almost normal, despite the fact that the affected part is still impervious. The diplococcus infection has reached its natural termination; the manifestations of pneumonia due to the latter have ceased, but the lung, being filled with exudates, is still crippled, and yet the breathing is but slightly embarrassed. Nature has accom-

[2] In the *Journal of the American Medical Association* for January 24, 1914, the statistics of the Philadelphia General Hospital for 1911 to 1913 are given as 596 cases of pneumonia, 203 of which were croupous pneumonia, with a total mortality of 61.5 per cent.

plished a miracle which human ingenuity with all its boasted progress has failed to imitate.

Pneumonia is really not any more a lung disease than is typhoid fever an intestinal disease. It is characteristic of the Sternberg-Fränkel diplococcus to expend the primary force upon the lung. It is characteristic of the Eberth bacillus to affect primarily the Peyer's patches. In many respects there exists a striking analogy between the two diseases. Like typhoid fever, croupous pneumonia is rare in very young children; it is most fatal among the middle-aged and vigorous, and its prognosis is seriously affected by the patient's previous habits and mode of life, alcoholism, etc. Both have a definite course, differing only with the difference in the nature and mode of development of the etiological microörganism. In pneumonia considerable time is required for the lung to resume its healthy natural condition after the serious manifestations have ceased, and great care must be exercised to save the heart sudden exertion during convalescence; in typhoid fever the intestinal glands continue tender and perhaps ulcerated after the fever has ceased, so that great care must be exercised regarding diet, etc.

The favorable result of the modern management of typhoid fever has led me to adopt a similar management of pneumonia, modified, however, by the special features impressed upon the latter by the difference in the characteristic of the diplococcus infection—its origin, location, rise, and decline, and the quality of toxæmia induced by it. The chief element in this management is strict attention to the minutest details: Give them your personal attention, no matter how well trained your nurse may be. The personal equation not rarely decides the issue of life or death.

1. *Absolute Rest.*—This should not only be advised, but a perfunctory execution of the order must be prevented by watchful care. The family may be assured that the disease, if croupous, will be of short duration, and that it is imperative to place all the resources of the household at the disposal of the physician. The best room in the house or apartment (especially in the latter case) must be selected, where the patient may be completely isolated from the family and friends, and placed under the care of a nurse or a member of the family. He must not be allowed to leave the bed for any purpose. All mental and physical effort must be avoided. This will not be an easy

task for the attendant. The use of the bedpan and the urinal will be especially resented; business affairs will often be presented to the head of a household; or the patient may inquire about these, to him, all-important matters; you must gently but firmly decline their consideration, and especially their discussion. The nurse must exercise tact and discretion, to avoid irritating the patient by her censorship.

I have in mind a colleague who was announced in the papers as a hopeless case of pneumonia, but who was saved by the method I desire to impress upon you. He could not be prevailed upon by two sympathetic and indulgent colleagues to use the bedpan until I pointed to the fact that his pulse was accelerated and enfeebled after each visit to the toilet.

2. *Ventilation of the Sick-chamber.*—This always demands the personal supervision of the physician. Repeatedly have I examined the windows and found them opened a few inches and the opening closed by a neatly-fitting shade. In very cold weather the nurses are prone to be guided by their own sensations in executing the order for free ventilation. Direct them to keep themselves warm by extra clothing; the patient is protected against taking cold by the febrile temperature, and a night-cap and blankets may satisfy the relatives on this point. I have not yet placed a patient under a window, as is now quite the vogue here, or on a veranda, roof, or fire-escape.[3] There is no doubt, however, that the free admission of fresh cold air into the sick-room during the entire course of the disease would neutralize toxæmia and then prevent the heroic stimulation and oxygen inhalation which often become necessary in the latter days.

3. *Diet.*—Inasmuch as the patient is usually attacked in the midst of health and the duration is not long, I have adopted a moderate diet in croupous pneumonia. In many severe types of this disease intestinal distention is so apt to embarrass the patient that sleep becomes impossible and often hastens a fatal issue by interfering with respiration, thus disturbing the heart. It is important, therefore, to so arrange the diet in the beginning that fermentation is prevented. Four ounces of broth into which a teaspoonful of barley jelly has been stirred, alternated with four ounces of hot milk taken in spoonfuls,

[3] It has recently been demonstrated by Northrup, Brannon, and Howland that moving cold air stimulates the vasomotor centre by its action upon the nasal mucous membranes and the facial terminals.

and slow sips every two or three hours, suffice during the entire period of the disease. After the crisis the diet may at once be made liberal. The dread of not sustaining the patient's vitality has too often led physicians to ply him with concentrated foods which have served to handicap rather than aid him in the struggle. *Sleep should never be interrupted for any purpose, provided it be normal.* Baths, compresses, medicine, food, and drink must be omitted during normal sleep.

The systematic drinking of very cold water is important. The nurse is directed to administer a few drops of some placebo, usually a teaspoonful of chlorate-of-potassium solution in not less than two and not more than four ounces of ice water every two hours. The quantity actually taken is to be made part of the record. The action of the ice water upon the gastric nerves and vessels is the same as its action would be upon the skin: it refreshes by the local shock, and the consequent reaction increases diuresis. I have often seen the urine doubled, and in one case of pneumonia the 24-hour record was 110 ounces, the nurse volunteering the statement that she had measured it. This method of administering ice water is far more effective as a diuretic than larger quantities of warm or cold water.

4. *Stimulants.*—In this scheme of pneumonia management alcoholic stimulants are rarely necessary except in habitual users of alcohol. In a consultation case of grippe-pneumonia, the patient being sixty-five years old, a diabetic, and the urine giving acetone reaction, both lungs were successively involved, the case became desperate, and yet stimulants were not required. Of course, the acetonuria was met by large doses of bicarbonate of soda in solution *per os* and *rectum.* In a case of pneumonia in my own family two teaspoonfuls of brandy were given occasionally to cheer the despondent patient (by suggestion). This was the only stimulant administered, although the case was of a desperate type. The prognosis in alcoholic patients is usually unfavorable because their peripheral vessels have been enfeebled and dilated by alcohol, and their nervous system deprived of capacity to respond to cold applications. Not rarely, however, the latter arouse reaction most gratifyingly.

5. *Drugs.*—Unless diarrhœa exists, or it is otherwise contraindicated, I advise the administration of 8 to 10 grains of calomel for the purpose of clearing the decks for action, as it were. The calomel

is administered dry upon the tongue and washed down with water. I am opposed to the prevalent small doses of calomel repeated at brief intervals, because they disturb the patient and tease the intestines.

All the pneumococci present in the mouth are destroyed by the rinsing with the calomel emulsion. Several copious stools result; if there is no result in six hours, oleum ricini or citrate of magnesia may be administered; calomel is probably the best intestinal antiseptic we have. All fermenting material being thus removed from the intestinal canal, the distention which so often handicaps recovery in the advanced cases of pneumococcus toxæmia is prevented. The mouth should be kept clean by rinsing it every hour with a saturated solution of chlorate of potassium. These are the only drugs I use; others you will doubtless be taught from the chair of practice.

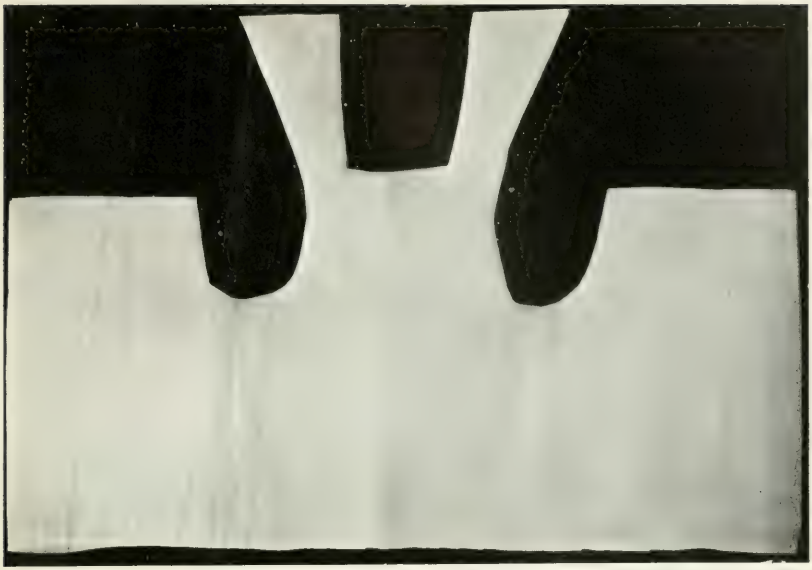
The judicious application of cold water, adapted, as I shall show, to the therapeutic indication of each case, is the most efficient single aid to the organism in its battle against the diplococcus infection. The application of water much below the temperature of the skin accomplishes the object satisfactorily, *provided it is executed with precision and due regard for the reactive capacity* of the patient.

The action of cold water is, in this disease, the same as that I have demonstrated as beneficent in typhoid fever, the difference being due to the more feeble resistance of the diplococcus to temperature reduction, which enables us to avoid prolonged or heroic procedures. As I have often impressed upon you, we must individualize more in hydrotherapy than in drug therapy. Failure results in the former from injudicious administration more frequently than in the latter. On account of the frequent presence of pleurisy and by reason of the more feeble toxæmia, the cold friction bath is not indicated in pneumonia as it is in typhoid fever. The temperature yields more readily to less heroic procedures. More frequent and less intense application of cold water is, therefore, indicated in pneumonia. For these reasons I advise you to use the mild and effective procedure next described.

6. *Chest Compress.*—The systematic application of the chest compress is the most important element of the best management of pneumonia. It is prepared in the shape of a vest. Three pieces of coarse linen are cut according to this pattern (Fig. 1) in such manner that the front portions will overlap an inch when enveloping the thorax. When applied, the compress should fit snugly from the nucha to the

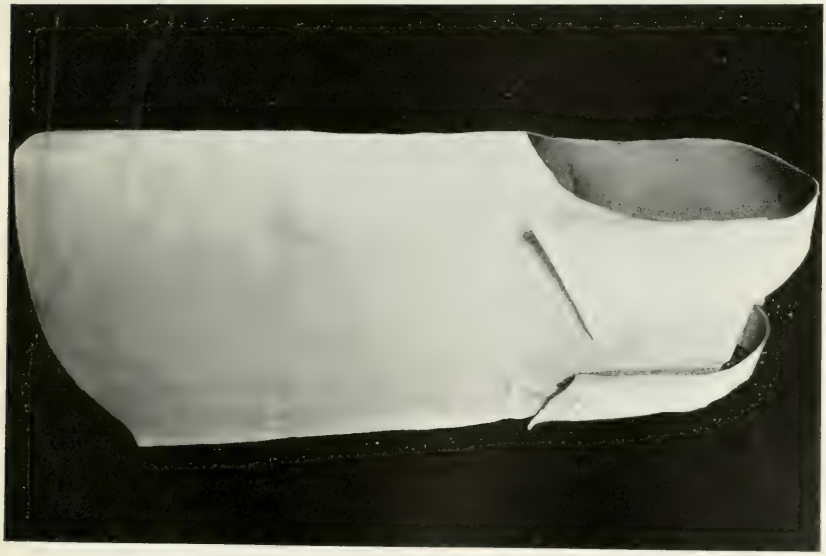
floating ribs posteriorly and from the clavicle to the umbilicus anteriorly around the entire chest and cover the clavicles with its flaps (Fig. 2). A piece of thin flannel is cut to the same pattern, but an inch larger all around. Two sets should be prepared, in order that one may be boiled briefly every day to prevent infection of the skin. The linen portion should be hemmed to make it fit snugly. Before the application of the chest compress the windows must be closed. The patient being exposed, he is gently turned to one side (Fig. 3); the compress is wrung out of water at 60° F. (this being the temperature adapted to the average case, and to be modified, as will be shown); the wet linen is now laid smoothly on the previously outspread flannel, leaving a margin of flannel around the entire edge. The entire compress, with its flannel cover, is now rolled half-way, and the rolled-up portion is laid against the one side while the remainder is spread upon the bed in such a manner that the upper edge reaches the nucha. The patient is now gently turned upon the back, so that he is laid upon the outspread portion of the wet compress (Fig. 4). The rolled portion is drawn forward from left to right side of the patient and is rapidly wrapped upon the chest; the other portion is also made to cover the right anterior chest, and the shoulder flaps are secured to the front. The flannel covering is now wrapped over the wet compress and its edges secured with pins quite snugly, but not too tightly to embarrass respiration (Figs. 5 and 6). If the compress is applied in this manner the patient will not be disturbed except by the gasp which follows the sudden impact of water so much below the body temperature—a salutary effect, as I shall show. When the body temperature is high the compress may be allowed to retain more water, but care should be taken that the bed be not made damp. Nurses are apt to prevent the latter by an impervious covering. This is an error; it converts the compress into a wet dressing or poultice which may elevate instead of reducing the cutaneous temperature. An extra towel under and over the compress will protect the bedclothes. The compress should be changed every hour, unless the temperature is below 99° F. *in recto,* when it should not be renewed at all, but removed when dry. To prevent chilling, let the nurse always ascertain, by introduction of the finger, if the linen is warm, and never change the compress unless it does feel warm. The removal of the compress is done as follows: The new compress is made

Fig. 1.



Pattern of linen for chest compress.

Fig. 2.



Pattern of a linen and flannel chest compress.

FIG. 3.

Half of linen and flannel folded against right side of patient.

FIG. 4.

The nurse, having drawn the right portion of the compress towards her, in the act of placing the linen part over anterior thorax.

ready; the flannel is unpinned and the entire compress removed from the anterior portion of the chest; the patient is now rolled upon his left side and the entire compress is drawn away with the least possible disturbance; the fresh compress is applied as described. Although the average useful temperature of the compress is 60° there is much latitude possible. Experience must decide upon the changes in temperature, duration and technic when the ordinary compress fails; for instance, when temperature reduction is needed, more water may be left in the compress. The rationale of this procedure should be well mastered in order to make the changes judiciously. Remember my hydrotherapeutic law: The sudden impact of cold upon the chest walls has the same effect which is observed from a dash of cold water upon the face or chest of a fainting woman; there is a gasp, more or less pronounced, due to the irritant action of the low temperature upon the nerve terminals, which is reflected from the central nervous system through the vagus upon the inspiratory muscles visibly and upon the heart invisibly, but positively, as shown by the pulse. The primary refreshing effect being upon the nerve-centres, the patient becomes bright. One of my patients remarked: "Whenever I began to feel 'dopy,' I thought it was time for a new compress."

The stimulant action of cold upon the reflex cutaneous areas is conveyed to the dorsal spinal ganglia, which control the pulmonary circulation. The reflex area, lying between the scapulæ, is, as you know, connected with the second, third, fourth, and fifth posterior dorsal ganglia, and the epigastric reflex area, located on the lower lateral portions of the skin covering the chest, is connected with the fourth, fifth, and sixth spinal ganglia. This physiological nexus may explain why our forefathers attributed powerful effects to poultices, sinapisms, and blisters applied to the chest. I believe that much of the beneficent action of the chest compress rests upon this physiological and anatomical basis. Moreover, the classical experiments of Romberg, Paessler, and Rolly with injections of pneumococcus cultures into rabbits have shown that heart-failure, which is the chief danger in pneumonia, is due primarily to the disturbance of equilibrium in the vasomotor system. You remember my explanation of the rationale of the cold friction bath in typhoid fever; I mentioned that, the resistance at the periphery being lost by reason of toxic action upon the peripheral vessels, the blood flows so sluggishly through them that

the heart is driven to great exertion in the effort to maintain life; the tension of the arterial system being greatly diminished, an increase in the number of pulsations is demanded from the heart. This demand often cannot be responded to; the heart labors harder and harder until it fails entirely. By improving the cutaneous circulation by cold hydriatic procedures the action of the heart is manifestly improved. The chief benefit of the cold bath in typhoid fever is, therefore, not reduction of temperature, but refreshment of the nervous system and consequent improved cardiac action.

What is the rationale of the action of the cold chest compress in pneumonia? The cold contracts the erector pili and muscular fibres, so abundant in the skin, and thus press the blood out of the thin endothelial capillary tubes, which have no elastic or muscular coats. This narrowing of the cutaneous vascular area of half of the trunk by the sudden impact of water 40° F. below its own temperature, combined with the reflex stimulation from the impact of cold, cannot fail to improve the vasomotor system, upon which the toxins exert their chief effect. The heart is thus relieved, by reason of restored resistance at the periphery which enhances the ventricular impulse; the pulse becomes slower and steadier and loses its dicrotic character; stases are prevented, because they are almost invariably due to enfeeblement of the peripheral circulation. A normal *vis a tergo* is thus established which is more salutary than the driving of the heart by digitalis and stimulants: the latter would only aggravate the failure at the periphery, just as would nitroglycerin, which is too often injudiciously resorted to in these emergencies. The most important element of this management of pneumonia is—let me repeat—not to await the establishment of heart enfeeblement with its serious hypostases, etc., and then treating them with strychnine, digitalis or other cardiac stimulant, or alcohol, but rather to maintain the integrity of the peripheral circulation from the outset and thus *avoid* the dangers which so frequently assail the pneumonia patient and contribute to a fatal issue. As in typhoid fever, the application of cold water must be chiefly prophylactic, to forestall lethal complications. The elimination of urine toxins is increased by the improved circulation in the glandular structure of the kidney, and the toxicity of the urine is enhanced, as shown by the experiments of Hewetson, of Johns Hopkins University. The increase of urine from this com-

FIG. 5.

Chest enveloped in linen; the nurse is in the act of covering it with flannel.

FIG. 6.

Completed chest compress; flaps over clavicle in place.

bined external and internal use of cold water will agreeably surprise you. Nurses have often declared it as phenomenal.

Temperature is moderately reduced by this treatment. After each compress the surface is cooled, but reaction follows which does not diminish vascular tone, but stimulates diaphoresis. The compress becomes warm and the moisture evaporates through the thin flannel covering by capillary attraction. A cooling of the skin which ensues may easily be noted when the compress is removed, the skin being found cooler than the compress. You will perceive how an impervious covering must neutralize this effect by converting the compress into a wet dressing which relaxes the vasoconstrictors. Cold stimulates the vasodilators and enhances the propulsive resiliency of the arterioles. The dyspnœa, which is often out of proportion to the lung area involved, is almost always relieved, if it be not prevented, by the compresses. This fact confirms my view expressed years ago, that dyspnœa not traceable to pleurisy is a nervous symptom due to the pneumotoxin, and not to the obstructed lung. The patient rarely dies of apnœa, as I was taught and as some now believe. That this is true is demonstrated by the clinical and indisputable fact already mentioned that, while a few hours before crisis ensues the patient may be gasping for breath and tossing under high temperature with a rapid pulse, after the crisis is established the dyspnœa disappears quickly with the other serious symptoms; the patient falls into calm slumber, his respiration becomes quiet, and this despite the fact that it is impossible for so decided a diminution in obstructed area to have taken place in so short a time as would produce so marked a diminution of dyspnœa. The physical signs testify that the consolidation has not decreased in the brief time intervening. Indeed, it is a peculiarity of the cold compress treatment that crisis rarely occurs and that the lungs become pervious very slowly, even after the patient is convalescent and out of bed. The patient must not be allowed to leave the bed until the lungs have become pervious, and the pulse is not increased materially by sitting up or standing. That this management of pneumonia, which I commend to your careful adoption, depends upon prevention of lethal complications is also proved by the sad fact that in hospital practice the disease is still very fatal.

In my last service at the Knickerbocker Hospital four cases died in three days, having been admitted respectively six, twelve, twenty, and

thirty-four hours before death. Nevertheless, the mortality in 156 cases collected by the then house physician, Dr. Albert Wittson, shows a reduction of 50 per cent. over that existing prior to the adoption of the chest compress and to 12 per cent. in cases that survived five days after the initial manifestations.

As in typhoid fever, our most reliable statistics are derived from military hospitals, in which patients are treated early and by well-trained attendants. In the military hospital at Dresden (200 cases) the mortality under the wet compress treatment was only 1.6 per cent., and Dr. Nespor, of the Austrian Army, reports ninety cases with one death.

There exists such unreasonable dread of cold water in the minds of the lay people that courage of conviction is demanded in the substitution of the cold compress for the warm poultice. It may readily be demonstrated that the cold compress becomes warm very quickly.

The shrewd business tact of the drug manufacturers has not been slow in availing itself of this prejudice. As a result, certain preparations composed of kaolin have now attained great vogue. These possess the faculty of retaining moisture and temperature, and really fulfil some of the indications of the wet compress when applied cold and of the warm poultice when applied warm. But they lack the most important beneficent action upon the vasomotor system of the compresses at 60° C., changed hourly.

In private practice, when the case is seen early, you will find this method invaluable. It will afford great comfort to the patient and brighten him by refreshment and invigoration. Reduce medication to a minimum, also food. Remember that rest is all-important. Normal sleep must not be interrupted, but the toxic slumber demands renewal of the cold compress to arouse the dulled reflexes and send the blood in joyous currents to every part of the circulatory area. Never leave the patient until you have seen the first compress applied. You may remember my similar injunction with regard to the cold friction bath in typhoid fever. You will find, in some of the hospitals to which you may be assigned, the most faulty hydrotherapy; for instance, a patient wrapped in a wet sheet and allowed to evaporate. This kind of cold pack chills the patient unless he is more vigorous than the average. Ask your attending physician to afford the compress

method a fair trial in connection with other treatment, and if he is not already convinced of its value he will become a convert. I trust you will become missionaries in the reduction of pneumonia mortality.

Finally, the management of broncho-pneumonia must be on the same lines. As I have indicated, in this type the diet may be more liberal, because the course is of longer duration. In the pneumonias of children the ten-minute cool friction bath of 95° F., reduced during the bath to 85° or 80° F. and given every four or six hours, is useful when pleurisy is absent, the chest compresses of 60° F. being applied in the intervals. When there is great pulmonary obstruction or cardiac failure in very young children, manifested by cyanosis, holding the little one in water at 105° F. and pouring on one or more basins of water at 70° F. or less over the shoulders will produce struggling, coughing, expectoration, and relief of cyanosis, not rarely changing the prognosis immediately. This cold affusion is not repeated within three hours, nor at all if reaction be not complete after the first procedure.

THE TREATMENT OF ACUTE PNEUMONIA

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In speaking of the treatment of acute pneumonia no reference will be made to any method except that which has proved useful in the author's experience. It should be clearly understood that in order to obtain a fairly intelligent idea in regard to good or bad treatment of any disease it is most important to have some estimate as to what course it will pursue, or how terminate if untreated; in other words, to ascertain the proportionate number of deaths or recoveries which will take place when the battle between the vital forces of the body and those of disease is allowed to go on without interference or disturbance from artificial sources.

Evidence which gives some idea as to the rate of natural recovery from untreated pneumonia may be gathered from the experience in some of the Vienna hospitals of about sixty years ago. Thus Dr. Dietl, from 1845 to 1846, treated 189 cases of pneumonia without medicine, and obtained a death-rate of 7.84 per cent.; and 750 cases from 1847 to 1850 with a death-rate of 9.2 per cent. Of these, 319 cases were complicated. In the homœopathic section of the Leopoldstadt Hospital, in the same city, 94 cases were treated with a death-rate of 9.57 per cent. In the same institution Drs. Wurmb and Caspar treated 24 cases, of which 12.55 per cent. died.

If these figures are reliable—and there is no evidence to the contrary—and allowing for the influence of food, nursing, and care which these cases received, from 85 to 90 per cent. of all pneumonia patients, under ordinary conditions, will recover without any medical treatment. According to this, the actual and real treatment of acute pneumonia resolves itself into saving a certain proportion or the whole of the 10 to 15 per cent. that are destined to die under other circumstances.

Yet, while it is true that in exceptional instances a considerable number of successive cases may be treated without experiencing any

mortality, not much credence is to be placed in the assertions which often reach our ears that in the course of a long and active practice no deaths from pneumonia were known to have taken place. Experience teaches that in the present state of our knowledge, no matter how good the regular routine treatment may be, there are always cases which, for some reason or other, are doomed from the beginning of treatment.

Inasmuch as acute pneumonia is known to prevail among alcoholics, diabetics, and those whose vital resistance is weakened by injurious occupations, this knowledge has given rise to the opinion (which has, however, been questioned by eminent authorities) that the robust and strong are exempt from this disease. On this point it may be remarked incidentally that some years ago the author was given access to the experience tables of a large life insurance company. From these it appeared that between 1850 and 1897—a period of forty-seven years—acute pneumonia caused 206 deaths, 15.04 per cent. of which occurred by the expiration of the first year; 6.79 per cent. during the second; 11.65 per cent. during the third; 2.91 per cent. during the fourth; 5.34 per cent. during the fifth year of insurance and so on, the last figure not being exceeded in a single year afterwards. From these figures, which show that the largest number of pneumonia cases occurred in the first year of insurance among these healthy and selected lives, and that the death-rate, on the whole, gradually declined afterwards, we learn that a superior degree of health does not afford immunity against an attack of acute pneumonia.

Though speaking directly on the treatment of pneumonia, it may not be considered out of place to add a few words on the pathology of this disease, since this will probably serve to make clearer its therapeutic indications.

Among its earliest pathologic manifestations are distention and engorgement of the pulmonary capillaries and a consequent sluggishness, and final stasis in the circulation of the affected parts. This process is well illustrated in embolic pneumonia following fracture. The oil-globules in such instances become impacted in the terminal vessels of the pulmonary artery, block the vessels, and the blood is forced into those channels which are still permeable, and, as a consequence, the blood-pressure is elevated in the latter, the serum of the

blood is forced into the alveoli and deposited there as a croupous exudate. From the stage of engorgement the pneumonia passes into red hepatization, then into gray hepatization, and finally into resolution.

The treatment of this disease, therefore, resolves itself into measures which (1) reduce the volume of blood in the lungs, (2) those which reduce the fever, (3) those which alleviate the disturbances of the brain and the nervous system, and (4) those which support the nutritive processes of the body.

After all the study in the development of the treatment of pneumonia, cold seems the one agent which more than any other practically meets the first of the above-named indications, *viz.*, reduction of pulmonary engorgement, since it has the well-demonstrated power of contracting the calibre of the blood-vessels, and of allaying and dissipating the local fulness and infiltration of the lungs. Indeed, it seems to have the capacity of doing more. For example, the application of ice over a pneumonic area which is wholly devoid of vesicular sounds, and with a flat percussion note and bronchial breathing, indicating beyond doubt that the stage of engorgement has been superseded by one of complete exudation and filling up of the alveoli, will, in the course of a dozen hours, develop a new group of physical signs, such as crepitation, reappearance of the vesicular murmur, diminution of dulness, etc., in the same area. These phenomena have not been found alone by the writer, but by others who have studied this interesting process.

It is not only in its influence on the local process of the lungs that cold shows its great value, but in its power to subdue the high temperature which almost invariably accompanies this disease. This has been demonstrated by Dr. Schlikoff, who introduced a thermometer into various organs and cavities of the body, applied ice externally at the same time, and found a local reduction of temperature of several degrees, while the axillary temperature either remained stationary or fell but slightly.

So far as the writer knows, the illustrious Niemeyer was the first to apply cold in the treatment of acute pneumonia. He says: "I have made extensive employment of cold in the treatment of this disease, and, relying on a large number of favorable results, can recommend the procedure. In all cases I cover the chest of the

patient, and the affected side in particular, with cloths which have been dipped in cold water and well wrung out. The compresses must be repeated every five minutes. Unpleasant as this procedure is in almost all cases, yet, after a few hours, the patients assure me that they feel a material relief. The pain, the dyspnœa, and often the frequency of the pulse are reduced. Sometimes the temperature goes down a whole degree. My patients often retain this surprising condition of improvement throughout the duration of their attack. . . . In only few cases the use of cold affords no relief, and the troublesome manipulation for its application increases the distress of the sufferers . . . and in such cases I have not insisted upon its further application" ("Text-Book of Practical Medicine," vol. i, p. 185).

For several reasons it seems that the ice-bags which are advocated by the writer are more practical than the cold compresses which are recommended by the eminent authority just quoted. They are dry, do not wet the bedclothing, their cold effects are more uniform and decided, because they retain a low temperature longer, and there is no need of changing them oftener than every two or three hours, unless the patient has a high degree of fever.

Probably the best way of applying cold to the chest is to surround its front and sides with rubber bags filled with ice, which are kept in place by a wide towel pinned or stitched around that part of the body. The number of ice-bags which must be applied in any case depends on the degree of fever which is present, and on the size of the inflamed area. If necessary, the whole chest front, sides, and the back so far as possible may be enveloped, and, besides, it is always advisable to apply one or two ice-bags to the head.

The length of time during which cold must be applied depends on the degree and the persistence of the fever. If the temperature falls to or near the normal point, and shows a tendency to remain there, the ice may be gradually withdrawn. It is best, however, not to remove all the ice-bags at once, even though the temperature is near normal, until the crisis is at hand without question. There is more risk in taking the ice off too soon than in allowing it to remain too long. If the fever rises after having been reduced by the ice, it is advisable to find out whether or not the inflammation has extended to a new field, and, if this is so, the ice should be applied

to the newly-invaded territory, and the temperature then will, in all probability, fall.

Besides its influence on the local inflammatory process in the lungs and on the accompanying fever, the ice-bag relieves pain and discomfort in the chest, quiets nervousness and restlessness, and very often induces sleep. The writer has frequently observed that patients who were fractious and inimical to the ice applications when first used were agreeably disappointed at the marked amelioration and relief which they derived from them.

While it is true that the greatest value of the ice-bag in the treatment of pneumonia is found in its control of high temperature, the writer, in advancing this point as a powerful accessory to good end-results, is not unmindful of the strong present-day tendency which rather scorns such measures on account of the widespread belief that fever is a valuable adjunct to counteract the germ-agency which is regarded as the cause of this disease. This is a mournful apology for the deplorable and fatuous predicament into which the so-called modern pathology and treatment of acute pneumonia has been driven. If a high pneumonia temperature is destructive to the germ-basis of this disease—which is not yet shown—it is absolutely certain that such a temperature is ruinous to the muscular tissue of the heart, as well as to the ganglia and fibres of the nervous system. The former has long been familiar to the profession, and more recently it has been proved experimentally by Brasch, Goldscheider, and Flatau, that the exposure of animals to artificially raised temperature from 3 degrees to 5 degrees Centigrade causes the same ganglionic nerve changes, *viz.*, clarification, swelling, and rounding of the whole cell, and the disappearance of Nissl's cell-bodies, as those which are found in pneumonic bodies, the temperature of which before death did not exceed 3 degrees Centigrade above normal.

If it is true that pneumonic fever destroys the integrity of the most vital organs of the human body—and there is no proof to gainsay it—is it not more rational, under these circumstances, to bend every possible energy towards allaying and circumventing this wasting force from burning up the body's vitality than to stand by, admire the work of the flame, and indulge the hope that it will somehow overcome a poorly-defined cause of the disease?

The treatment of pneumonia has given rise to many heresies,

and there is reason to believe the one just described is the worst entanglement into which it has yet fallen. Need any one be surprised that the average general results of the treatment of acute pneumonia at the present time are not much, if any, better than those which are afforded by the disease when it is allowed to pursue an unrestricted and untrammelled course?

There is, too, a prevalent belief that most pneumonia deaths occur on account of cardiac failure. The old and oft-repeated story is that "he would have recovered if his heart had held out." The writer must confess that he never sympathized with this opinion. No one would be rash enough to assert that cardiac failure may not happen in the course of this disease, yet there are good grounds for believing that this is the exception. The fear of cardiac failure in pneumonia may be fraught with serious indirect consequences; for if the fate of a patient is regarded as being more dependent on the integrity of the heart than on that of the lungs, then in emergencies which may arise at any time medical attention is more likely to be directed to the heart, which is usually belabored with digitalis and heart-tonics, often to its detriment, while the lungs, which may really be the cause of the trouble, are left uncared for. The more we regard pneumonia as a disease with which the heart has less to do than the lungs the more favorable will be the termination of this disease in any given average case, as the following considerations tend to show:

From a general developmental standpoint it may be deduced that the biologic older organs of the body are more mature, have a firmer equilibrium, and are less liable to disease than the younger organs. Thus the circulatory system, of which the heart is a specialized part, arises low down in the higher group of worms (*Chordonia*), while the lungs first appear higher up in the group of fishes, and are even then endowed only with a slight respiratory capacity. In the human embryo the heart and the circulatory organs appear early in form as well in function, but the lungs possess no functional activity until after birth, when breathing starts, and then often in a precarious manner.

From this it appears that the popular doctrine that the heart is very much more liable to be embarrassed by pneumonia or any other disease than the lungs is not supported by biologic evidence; but, on

the other hand, there is sufficient clinical proof to show that the reverse is true. For example, acute intoxication of ether, chloroform, alcohol, opium, etc., all arrest the action of the lungs before that of the heart. In Landry's paralysis, and in other respiratory paralyses, in which the disease usually starts in the peripheral nervous system and extends to the central organs of the body, the lungs, as a rule, cease to functionate before the heart: the latter, in a number of instances which are on record, maintained its pulsations for some hours after the respiration had ceased.

The relative vitality of the heart and lungs in the treatment of acute pneumonia is, therefore, of great consequence, inasmuch as the present trend of opinion points out more danger from cardiac than from pulmonary collapse, and that the one requisite to resolve the pneumonic engorgement is to goad the heart with stimulants and tonics in order that it may pump the blood through the more or less impervious pulmonary capillaries. The truth is, that the chief lethal tendency of this disease comes from a defective supply of nerve force to the lungs, as a result of general nerve exhaustion, which manifests itself not so much in simple accelerated breathing as in a frequent, laborious and shallow movement of the respiratory organs, accompanied by a vigorous compensatory action of the diaphragm.

In treatment, efforts should be made to anticipate and forestall the latter tendency from the very beginning, and one of the best drugs is strychnine, which, owing to its stimulating action on the general nervous system, and on the respiratory nerve supply in particular, is well adapted for use in this disease, as well as in almost all other affections of the pulmonary tract. Over and above its valuable influence on the lungs, it is equal to digitalis in enhancing the function of the heart, and so overcomes some of the most serious tendencies to death in this disease. The drug should be administered in $\frac{1}{32}$ grain doses four times a day in the following combination:

R—Strychnine sulph.....Gr. i
Quinine sulph.....℥i
Ammonium chlor.....Gr. xxx
Tincture of the chloride of iron.....f℥p
Chocolate syrup, q. s.....f℥iv
Mix.
Directions—one teaspoonful four times a day.

In case of a tendency to cardiac embarrassment, an additional dose of $\frac{1}{32}$ grain of strychnine may be added hypodermically morning and evening. A tablespoonful of the infusion of digitalis leaves four times a day or oftener is also advisable at this time.

Delirium, nervousness, twitching, picking at the bedclothes, etc., are unfavorable symptoms which tend to develop at this stage of the disease, and require watchful attention. They are usually associated with a hard, dry, and crusty tongue. One of the most efficacious remedies in this emergency is the tincture of capsicum given in doses of from ten to twenty drops, and even more, in water, every two or three hours, or oftener. The effect of capsicum is particularly valuable in alcoholic pneumonia at this stage. Under these conditions the writer has seen half-teaspoonfuls of this drug given every hour in water followed by very favorable results. In case of sleeplessness and violent nervousness a quarter of a grain of morphine sulphate, with atropine, given hypodermically, is indicated.

If, in marked depression and a tendency to collapse, the extremities are cool, apply hot-water bags or hot flaxseed-meal poultices to them, but, if fever persists, continue the ice-bags to the chest and head at the same time. In this stage oxygen given by inhalation is of immense service. It is, of course, only a temporary measure, but it often assists greatly in bridging over a crucial period.

In the profound nervous manifestations of this disease the writer has observed great relief from the hypodermic injections of five minims of a five per cent. solution of crotalin in the forearm every other day.

Throughout the whole course of the attack it is highly important that the patient receive the most nourishing food. In other words, his resisting power must receive ample support in order to repair and rebuild the textures that are rapidly disintegrating in his body. Feeding here implies the administration of food which concentrates a large amount of nutritive material in a small bulk, and which requires a small amount of digestive energy on the part of the stomach and the intestinal tract to utilize it. Such a food is readily provided in the freshly-expressed juice of beef-muscle, of which a teacupful is given cold every twelve hours with a little salt and pepper. If the stomach is irritable it must be given in oft-repeated half-teaspoonful doses every fifteen or thirty minutes. Oyster and clam juice is also useful.

These foods are prepared in the following manner: Beef, prefer-

ably taken from the round steak, is cut into pieces of the size of a walnut and placed in a pan and held over a hot fire temporarily for the purpose of merely broiling the surfaces. Stirring accelerates the process. The pieces are then placed in the hopper of a large-sized beef-press (the Osborne or the Columbia beef-press is suitable for this purpose), which separates the juice from the fibre of the muscle. The juice is divested of fat and taken cold as directed above. In the case of oysters and clams, heat is applied first in the same way, and the juice is then expressed and taken well seasoned, but in smaller doses than the beef juice. These juices contain the very essence of fresh nourishment, and are easily administered to the most squeamish of stomachs.

Next in importance comes milk, which is to be given in half or whole tumblerfuls every three or four hours, with or without whiskey or brandy. With the exception of an occasional egg with milk, or milk punch, no other food is necessary until convalescence is under way.

The temperature of the sick-chamber must be maintained at a uniform rate, the air allowed to circulate and be kept pure. All noises must be excluded so far as possible. Liquid discharges from the bowels, which sometimes occur frequently during the crisis or at other periods of the disease, should be disinfected.

Concerning the final results that have been obtained from the method of treatment outlined above, it may be stated that about a dozen years ago the writer collected 400 such cases from the experience of his fellow practitioners, as well as from his own, among which seventeen deaths occurred, or a death-rate of 4.25 per cent. No tabulation has been made of quite a large number treated in the same way since that time, but the writer's feelings are that his subsequent experience has not been any less favorable.

In conclusion:—When there is good reason for believing that eighty-five to ninety per cent. of all pneumonias will under ordinary conditions recover without any treatment, it is plain that the question of results in this disease resolves itself into saving the ten or fifteen that would otherwise die out of every hundred, and that any treatment or method of treatment that does not afford a smaller death-rate than ten or twelve per cent. may be regarded useless, if not harmful.

Viewed from this standpoint, there can be no question concerning the favorable nature of the results embodied in a collection as large

as that on which this paper is based, especially when we realize that they were not secured from a single source, but come from as many as fifty independent observers, among whom were a number who had treated a score of cases without a single death. This in itself speaks much in favor of the treatment, for it shows that the personal equation of any one contributor did not enter very largely into the question of total end-results.

A note or two may be interesting on the treatment of pulmonary gangrene with the hypodermic administration of crotalin—a comparatively new remedy. While this is rather a rare sequel of pneumonia, it is always a serious complication when it does occur, and, for this reason, it seems worth while to give a brief *résumé* of three cases in which this agent had been employed—two of which, as far as the writer is aware, being the only cases reported.

The first is that of Dr. R. E. Kinlock, of Brooklyn, New York[1]: Male, aged 61, subject to an unresolved grippe-pneumonia from October 20, 1909, when he was first seen by Dr. Kinlock. Before the latter time the patient had been seen by several other physicians, who agreed as to the diagnosis and gave an unfavorable opinion. Patient was exhausted, emaciated, with face drawn, poor appetite, anxious expression, delirium, short and catchy respiration, breath exceedingly foul and putrid, difficulty of speech, and constant cough and expectoration. Temperature 102.5° F., pulse 118, and respirations 42. He received $\frac{1}{200}$ grain of crotalin hypodermically on the first day and repeated every second day, and in the course of a few weeks was increased to $\frac{1}{100}$ grain, at the same interval. At the end of a week pulse and temperature were the same, but appetite, respiration, and mental condition were markedly improved. In the fourth week the temperature came down and strength increased. In the fifth week he was allowed to sit up part of the day, expectoration was less, and the odor of his breath had almost gone. The sixth week he received crotalin, $\frac{1}{50}$ grain, every second day, and from that time on made a complete recovery.

Second Case.—On December 13, 1910, the writer saw in consultation a man, aged 38, with history of chill five days before, suffering with consolidation in posterior region of right lung, cough, brown, bloody expectoration, morning temperature of 103° F., pulse 114,

[1] *American Journal of Clinical Medicine*, Nov., 1900.

respirations 40 to 50, great restlessness, and muttering delirium. Abdomen was distended, and all the physical signs and symptoms indicated a condition of lobar pneumonia complicated with typhoid fever. On the 17th he had a severe intestinal hemorrhage—losing probably a quart of blood—and vomited about four ounces of blood-colored mucus, his breathing being shallow and labored, and his pulse very irregular. Hemorrhage from the bowels continued at frequent intervals, accompanied by diarrhœa. On the 20th rose-colored spots appeared on the abdomen, and the temperature fluctuated from 101° to 104° during the day. During the middle of January his cough became much worse, and he began to expectorate a large amount of yellow, tenacious, and very putrid mucus, which was accompanied by a very offensive breath, and the air of the room was foul and loathsome. At this stage the case gave every evidence of being in a very critical condition. The body was much exsanguinated, greatly emaciated, there were present unconsciousness, low muttering delirium, picking at the bedclothes, labored breathing, chest-walls of a glossy, pallid appearance, and all the symptoms of aggravated pulmonary gangrene with impending death.

So far the treatment consisted in the application of ice-bags to the chest and abdomen, together with strychnine, quinine, iron, morphine, and beef juice, but between January 13 and 20, 1911, he received four doses of crotalin hypodermically, ranging from $\frac{1}{200}$ to $\frac{1}{100}$ grain, during which time there was not much, if any, change. From January 29 to February 27 he received $\frac{1}{50}$ grain of crotalin every other day, and from this time his cough, expectoration, delirium, sleeplessness, pulse, temperature, respiration, and strength showed signs of rapid improvement, and his appetite became really ravenous. Convalescence went on without interruption. By April 27 he had regained his former weight (147 pounds), and has felt well ever since.

The third case was a woman patient of my own, aged 39, in which a belated, unresolved pneumonia of the right lung developed into gangrene and empyema of the same side. At the beginning of the gangrenous condition $\frac{1}{100}$ grain of crotalin was given hypodermically, and continued every other day until she had received four doses, by which time all signs and symptoms of gangrene had subsided. After this the accompanying empyema was drained, and the patient made a complete recovery, and is now, nine months after her attack, able to follow her previous occupation.

TREATMENT OF LOBAR PNEUMONIA

BY CHARLES F. d'ARTOIS-FRANCIS, M.D.

Brooklyn, New York

Lobar pneumonia has a retention of chlorides and phosphates, the former being retained in the inflammatory tissue of the lung and other parts of the organism, the latter in the general system. The blood has an antitryptic action in excess of the tryptic one, due to its reaction, there being an under-alkalinity. Sulphates are in excess from proteins; lactic acid from suboxidation of sugar, also from fat (?) and protein of the organism, while other acids are present, derived from protein and fat of the general system, though what they are I am unable to state. Pneumonic blood has fibrin in excess (Pfeiffer)[1]; proteins are deficient (Brandenburgh)[2]; the viscosity is increased, due to sodium chloride and cyanosis (Austrian).[3] Now by supplying Na_2CO_3 anhydrous and dried horse serum the chlorides and phosphates are driven out; the proteolytic and glycholitic (?) ferments, besides the protective and autolytic enzymes, are acted on. The bactericidal power of the blood is increased, for the proteins of the horse serum increase the alkalinity when in contact with the carbonic acid gas, CO_2 (there is an increase of CO_2 in pneumonia), through its breaking up the cleavage of the non-diffusible alkalinity in the proteins, thereby making the blood more alkaline and increasing its bactericidal action. The Na_2CO_3 absorbs the carbonic acid which is given off by the lungs, and also increases the alkalinity of the blood. Œdema of the lung is a complication in pneumonia, and NaCl is present wherever œdema is (Starling).

R—Dried horse serum from 500 Cc. of fluid serum.
Sodium carbonate (Na_2CO_3 anhydrous) 1.62
Aqua distil., sterilized ..... 500 Cc.
Dissolve horse serum in water, then add Na_2CO_3.
Sig.—inject in vein once or twice a day, according to severity of case.
(Hypodermoclysis might be tried.)

[1] Pfeiffer, *Zeit. klin. Med.*, 1897 (33), 214.
[2] Brandenburgh, *Deut. med. Woch.*, 1902 (28), 78.
[3] Austrian, *Johns Hopkins Hosp. Bull.*, 1911 (22), 9.

When there is pain I resort to morphine, strapping of affected side with adhesive plaster, cataplasms, sometimes blister. If the heart is weak, or a liability exists to œdema of the lung, give calcium chloride, 0.6, in water, if it can be administered, by mouth, every two or three hours; if not, then use rectal injections of lime water, 500 Cc., every two or three hours, slow flow (Murphy method), until the heart is controlled, or use a larger quantity at one time. Lime expels the sodium chloride, thus drawing off the œdema; it also controls any nervous symptoms which may arise.

When bowel symptoms of wind, etc., appear, I prescribe sodium bicarbonate, 0.78; pancreatin, 0.25, in a tumblerful of water; in fact, it is well to give it at the outset of the disease, as a matter of routine, for when a heart is none too strong, as in pneumonia, wind in the bowel is a bad thing.

Diet.—This should be food which can be digested by the stomach and very little of that which is digested by the bowel. Let no sugar, gruels, etc., be given.

My cases numbered ten, my not being attached to a hospital accounting for the small number treated. Convalescence took place, in all cases, 72 hours from the time of the first injection. One had delirium, etc., for which I used calcium chloride, with some relief; afterwards I had recourse to lime water rectal injections, which soon quieted the delirium and nervous symptoms. Another had a weak heart, in which case calcium chloride was given, with speedy restoration of tone.

WHAT RADIUM CAN DO

BY HOWARD A. KELLY, M.D., LL.D.
Professor of Gynæcology, Johns Hopkins Hospital

Radium therapy, after the preliminary flurry in the newspapers, which created an expectation of impossible things, has settled down on a basis of daily tests made upon every kind of malignant disease in all parts of the body.

It is already evident, generally speaking, that radium will cure a large number of cases of cancer and sarcoma, if taken sufficiently early and if not too diffuse or metastatic. The earlier announcements of the value of radium in these cases raised false hopes in the breasts of many who were in the last stages, and some of whom were even, literally, dying. This class is not applying for treatment in such large numbers now, so that the available radium is being used in doing its more legitimate work. Lymphosarcomata, as a rule, everywhere show a remarkable susceptibility to radiation, and large growths of this character in the neck, in the throat, in the chest and the abdomen have melted down under its use sometimes in a few days. Superficial epitheliomata also show a great susceptibility to treatment.

In gynæcology the value of radium in four fields is incontestible:

1. It is of the highest value in inveterate pruritus, giving immediate relief, and often curing without operation.

2. It stops uterine hemorrhage, whether due to a diseased myometrium (cases common near the menopause) or to faulty ovarian activity. By it the menses can practically always be stopped without operation.

3. Most cases of cancer of the cervix are extraordinarily affected, and shrink often from the inoperable down to the operable stage. In a number of the latter cases the growth has disappeared completely, as proven by a subsequent operation on removing the uterus! This realizes the highest hope of the gynæcologist.

4. Many uterine fibroids are caused to disappear by it, so that this is clearly the preferable method of treatment. In young women

this shrinkage of a fibroid can sometimes be effected without suppressing menstruation.

Radiotherapy is a difficult specialty, requiring study and experience. Some of the factors which one must consider in treating patients are these:

1. Age of the patient.
2. Nature of the growth.
3. Site of the growth.
4. Size of the growth.
5. Its metastases.
6. Its individual susceptibility.
7. The susceptibility of the parent growth as determined by that of a metastasis.
8. The amount of radium available and the amount which it is advisable to use.
9. The extent of the area to be treated at one session.
10. When it will be advisable to treat again.
11. The distance at which it is best to keep the radium from the growth during treatment.
12. The protection of surrounding, or, in the mouth, of opposed, parts during the treatment.
13. The screens which it is best to use to modify the rays.
14. The use of the emanation or active deposit, instead of the radium salts.
15. Whether to introduce the radium or emanation into the substance of the growth.
16. The question whether any drug or metallic salt will activate the radium.
17. The use of X-ray with radium and its proper time, dosage, and distribution.
18. The value of cross-fire applications of radium.
19. The portal of entry, whether inside or outside of the body, or both.
20. The question as to the relative value of prolonged treatments of small dosage, or shorter treatments with larger dose.
21. The treatment of symptoms—pain, bleeding, discharges.
22. The character of the various sequelæ of a radiation, and the care of the patient after treatment.

23. The question of recurrences after apparent cure, and the continued susceptibility to, or immunity from, the disease in such cases.

These are some of the questions constantly arising in the mind of the radiotherapist.

One dare not yet limit the field of radiotherapy; with more radium and more experience even cancer of the stomach may be favorably affected by it. Radiotherapy is a specialty even more elaborate and recondite than its congener, X-ray therapy.

The womb of the future is big with hope; no man can predict how much of blessing it holds for the army of sufferers from cancers and tumors of all kinds; therefore let no one dare prematurely to assign any limits to the field of this new agent.

METHODS OF PREPARING AND APPLYING RADIO-ACTIVE SUBSTANCES *

BY WILLIAM DUANE, Ph.D.

Assistant Professor of Physics and Research Fellow of the Cancer Commission, Harvard University

In this paper four methods of preparing and applying radio-active substances are described: (*a*) Filling very small capillary tubes with radium emanation. These tubes are put into a fine metal tube (about the size of the needle of a hypodermic syringe) and inserted into the tissues, or arranged in rows on a metal plate or piece of adhesive plaster, thus forming a surface applicator. (*b*) Filling small glass bulbs about the size of the head of a pin with radium emanation. These bulbs are inserted through a trochar deep into the tissues, and when several of them are distributed throughout the volume of a tumor they form a sort of volume distribution of a radio-active substance. (*c*) Making sheets of metal (or other substances) highly radio-active by depositing on them radium α, β, γ. These sheets are cut into any shape and used as surface applicators. They are useful in cases where a short exposure to intense radiation is desired. (*d*) Making very radio-active solutions for hypodermic or intravenous injections. These solutions contain a large number of millicuries in a few drops of liquid, and produce very intense effects, owing to the fact that the α-rays are brought into play.

In order that the above methods may be of practical value, it is essential to have a process of extracting, purifying, and compressing the emanation that is rapid and efficient. The author began the study of this problem some four years ago in Madame Curie's laboratory, and has perfected a method by which the emanation from several hundred milligrammes of radium can be purified and sealed into a small glass tube, the volume of which is only a small fraction of a cubic millimetre. The method is a modification of methods previously

* A paper presented at the Toronto Meeting of the American Association for Cancer Research, May, 1914.

employed by Ramsay and Soddy, Rutherford and Debierne (see Madame Curie, "Traité de Radio-activité," Tome I, p. 313). The chief advantages due to the modification are that the purification can be performed in about ten minutes and without the aid of liquid air. There is, also, no appreciable loss of emanation other than that due to its own natural decay, and the process may be repeated as often and at as short intervals of time as desired without renewing parts of the mechanism.

In methods (*a*) and (*b*) a capillary tube of the desired size is sealed on to the apparatus, and, after the purified emanation has been pumped up into it, the tube is sealed off at the desired length by means of a tiny gas flame 1 or 2 mm. long. These glass tubes, while they are strongly radio-active, are put into metal tubes and used singly, either by insertion into tumors or otherwise, and, when they become weak, are placed alongside other tubes on surface applicators. In this way they are used for a month or more, and thus less than one per cent. of their activity is wasted.

The above method may be used also to introduce emanation into tubes of any size or shape or into metal containers similar to those described in the 1913 report of the Radium Institute of London.

In method (*c*) the sheet of metal (or other substance) is wrapped around the inside surface of a glass tube, and this tube is sealed on to the apparatus. The emanation is pumped up over mercury and left for a time in contact with the sheet. It is then withdrawn and stored so as not to waste it, and the active sheet is applied to the tumor with proper filtration and protection of healthy tissue. The most active surface applicator the author has prepared for actual use so far contained about 40 millicuries per square centimetre. The amount of activity, however, is limited only by the quantity of radium available.

The radio-active solutions in method (*d*) are obtained in several ways: (1) A few grains of salt (NaCl, for instance), just enough to produce a normal physiological salt solution when dissolved in the desired volume of water, are put into a small glass bulb, and the bulb is sealed on to the apparatus. The purified emanation is then pumped up between the grains of salt, on which it deposits radium α, β, γ. After several hours the emanation is withdrawn so as to save it, and the salt dissolved in the given amount of water.

(2) An equivalent amount of NaOH, instead of NaCl, is put into the glass bulb and radium α, β, γ is deposited on it as above. This active salt is dissolved in the desired volume of water containing just enough HCl to neutralize the NaOH, producing the radioactive physiological salt solution.

(3) A small glass bulb (say of ½ or 1 Cc. volume), with a fine capillary tube attached, is sealed on to the apparatus, and, after purification, the emanation is pumped up into it. The bulb is then sealed off with the emanation inside it. Since the emanation at atmospheric pressure would fill only a small fraction of a cubic millimetre, the bulb has practically a vacuum inside of it, and hence, if the small capillary tube is broken under water, or under normal physiological saline solution, the liquid runs up into and fills the bulb. The emanation then goes into solution. In this way very concentrated solutions of emanation and radium α, β, γ are made.

The above methods have been in use in the laboratories and hospital of the Cancer Commission of Harvard University since August, 1913, and have proved to be both efficient and flexible, and the danger of losing radium is reduced to a minimum.

RADIUM AND ITS EMANATIONS IN INTERNAL TREATMENT

BY JOSEPH MUIR, M.D.
New York City

After the first gasps of astonishment at the discovery of radium by M. and Mme. Curie had passed, and the world had learned something definite about its nature and characteristics, it was but natural that the deductive German mind should apply itself to the question of its practical application.

The nearest and most appealing field was that of therapeutics—the art of healing. What wonders were in store in its application to problems that had remained unsolved and baffling in spite of the tremendous advances of medical and chemical science and the tireless researches of thousands of brains for the last fifty years? What would be its successes and what were its limitations? What were the possibilities of a new healing agent that was enough to send the *savants* of Europe—for in this country practically nothing had been done—into the maelstrom of researches and experiments?

With the many untoward results of the earlier experiences with the Röntgen and other rays in mind, the medical specialists of Europe, and particularly in Germany, approached radium and its emanations with caution. But it was soon found that no such dangers were connected with its use as was the case with the more active rays of electric origin. There were no burns, for instance. Perhaps that was due to the great dilution in which radium was found, one might say; like one grain imbedded in a ton of inert material, for instance—and for that reason could not act with great intensity.

Radium acts through its emanation, which is a gas. The substance itself is practically indestructible; it is calculated to last from 2000 to 5000 years. These emanations are again decomposed into solid bodies, which again emit alpha, beta, and gamma rays. These collective changes are grouped together under the name of radio-activity.

During the preliminary experiments with radio-active substances

attention was soon called to the discovery that the waters of the well-known thermal baths, such as Gastein, Münster, and Töplitz-Schönau, also possessed radio-active properties. As these baths had, since time immemorial, and based entirely upon clinical experience, been used for the more or less successful treatment of gout and rheumatism, the inference was not far to attribute their healing powers, in part at least, to their contents of radio-active substances. This naturally pointed the way for the immediate experiments in clinics and hospitals.

In the meantime the nature of radium and its emanations had been studied more closely, and the invention of the Fontaktoscope enabled the researchers to measure the exact quantities of these gases given off by the mother substances, much like an electric volume is measured. This enabled, of course, a closer physiological study. Experiments on animals thus showed that the emanations, in their various forms, were absorbed by the system, and that they were stored in the blood, the liver, brain, the digestive tract, etc., as well as in certain tissues, and that while thus stored they continued their activities the same as when they were outside the body; also, that they were slowly exhaled through the lungs in the course of a few hours. If exhaled into a confined atmosphere, these emanations would retain their original activities and could be re-inhaled and exhaled for an indetermined time, all the while exercising their peculiar effects upon the system. In fact, there was a distinct tendency to establish an equilibrium between the amount contained in the body and that in the surrounding atmosphere; in other words, an effort towards equalization. It was also ascertained that very little passed through the skin; that nearly all was absorbed through the lungs.

Experiments further proved that the ultimate split products—the alpha, beta, and gamma rays—were the ones that exercised the peculiar effects noticed, and that these were elective; that is, they affected particular tissues—embryonic tissue, the tissue of tumors and inflammatory tissue, for instance, and also largely modified inflammatory processes. They also increased the number of red blood-corpuscles, and concentrated the leucocytes, the white corpuscles, the defenders of the blood, for attack upon invading disease bacteria. Further, they increased the activities of the ferments of the digestive tract, the enzymes of the pancreas, the peptic ferment, the lactic acid, the diastatic and glycolytic ferments; or, perhaps, it was through the stimula-

tion of the glands producing these ferments. However, it indicated an increase in metabolism—change of nutritive matter—an important thing, both in health and disease, and underlying all processes of recovery. But, most interesting of all, so far as application was concerned for direct and distinct therapeutic purposes, radium emanations were found to cause the disappearance of uric acid from the blood. The importance of that result for the specific treatment of gout and rheumatism was at once self-evident, and most of the subsequent researches and experiments centred upon that particular outcome of radium treatment. At once hospitals and clinics became busy under the guiding hand of the leading men in that specialty. Special apparatus was devised and installed for the production and inhalation of radium emanations in measured quantities, and the various results were checked and proved and properly classified for the purpose of eliminating cases impossible of cure or betterment.

Thus, cautiously proceeding, the outcome of the careful, scientific, and prolonged treatment of cases properly diagnosed—and where the anatomical, pathological lesions had not progressed too far—was astounding. Cases, especially those of gout and muscular rheumatism, that had resisted all other known forms of treatment, began to yield in the third or fourth week; for, of course, such a condition could not be changed over night. Even inflammatory rheumatism of the joints, some of them acute, painful ones, some of them subchronic with swellings, and even some chronic with deformities and adhesions, were either benefited or cured. Of course, there was a percentage of seemingly incurable ones, hopeless from the start on account of the great anatomical changes in the tissues affected; because nothing in the world will ever restore cartilages, for example, that have completely degenerated.

We will let some of the reports speak for themselves. Professor Klemperer reported to the *Berliner medizinische Gesellschaft* as follows:

" Last year, when I heard, at the Wiesbaden Congress, Gudzent's paper, I expressed myself rather skeptically. This I regret to-day, for in the meantime I have convinced myself of the efficacy of radium emanations in exceedingly severe cases of rheumatism. I can say now that such successes as have been attained with the radium treatment have never been achieved with any other method. Judging from the result of the discriminating treatment, as conducted under super-

vision of Herr His, I know of nothing better for cases of gout and bad rheumatism."

Professor Dr. W. His, director of the Universitäts Klinik of Berlin, and Dr. F. Gudzent, assistant at the Klinik, make the following observations in the *Berliner klinische Wochenschrift:*

"Of one hundred rheumatic cases treated with radium emanations, forty-seven were improved, twenty-seven considerably improved, five practically cured, thirteen were not influenced, and in six cases we were not able to ascertain the result. The most interesting cases were naturally those in which the use of the limbs were almost or completely restored. The best result was obtained in a long-standing case of myalgia (muscular rheumatism). Most benefit can be expected in cases which are not too old and in which the chief changes are swelling of the joints and infiltration of the capsule. The dry state in which the capsule remains unaltered, while the cartilage is considerably degenerated and the musculature around the joint is always involved, yields very favorable results to the extent that the pain is diminished, the contraction of the muscle lessened, and the motility increased. Here is a case in point:

"An eight-and-a-half-year-old child suffered for nearly a year from symmetrical swellings of all the joints, so that it could hardly move either hands or feet. After eight weeks' treatment it had regained the use of the hands. And this is so much the more remarkable as chronic rheumatism in children is usually very obstinate.

"A twenty-year-old girl who had suffered over two months from subacute swellings of both knee-joints was dismissed as cured after three weeks' treatment. The same happened in a case of a subacute swelling of both ankle-joints.

"Another girl, nineteen years of age, has been afflicted with inflammatory rheumatism of all the joints of hands and feet. Numerous efforts to effect a cure had been without results. In the beginning the treatment with radium emanations seemed to increase the pain—the so-called 'reaction' had set in; then, for a while, the condition remained stationary, but began to give way under the continual treatment. After three months the swelling of the joints was considerably reduced and the use of hands and feet became again possible. From the latest reports received, the girl was dancing. Of course, such a favorable result as this is not obtainable in all cases. The results in gout were even more striking. Of twenty-eight patients, four re-

mained unaffected, while in twenty-four a very marked improvement in the condition resulted. The most noted effect was in connection with the uric acid in the blood. According to Garrod's investigation, gout is characterized by a permanent presence of uric acid in the blood, and recent studies have demonstrated that, while a rigid diet may diminish it, it can never be made to disappear altogether in that way. He examined the blood both before and after treatment with radium. After fourteen days it persisted in but three patients, and in these it remained even after a persistent course. The clinical improvements did not always run parallel with the uric acid content of the blood. It is, of course, of importance to know if the attack is due to rheumatism or gout, because the axillary treatments differ accordingly. In gout dietetic treatment is essential. But the differentiation is, by no means, as easy as is usually believed. The diagnosis of so-called masked gout is rather difficult. A single examination of urine is not decisive. Uric acid can be detected with certainty only by an examination of venous blood. Some of the very common myalgias of the neck, shoulder, and lumbar muscles are undoubtedly of gouty nature, while others are rheumatic. Patients who reveal symmetrical and creeping inflammation of the smaller joints, which often lead to the clinical impression of being rheumatic, have sometimes proved to be gouty; neuralgia and, especially, sciatica result from this cause much more frequently than is usually supposed.

"The net result of our experiments proves that, in order to obtain definite results, patients must sit for at least two hours a day in an atmosphere charged with the proper amount of emanations for a requisite time. Only in exceptional cases is an increase in the emanation doses indicated."

The above reports give a good, general prospective of the success so far achieved in the treatment of gout and rheumatic lesions by the inhalation of radium emanations. In the following we give some more specific cases of somewhat different type, as reported by Dr. Kable, of Bad Munster:

No 1.—Sixty-year-old patient, suffers for eight years from gout of the joints of both feet and fingers, besides the right knee-joint, the use of which is very much restricted. Has tried a number of well-known bath cures without result. After six weeks' treatment the knee-joint is again freely movable and is otherwise nearly recovered.

No. 3.—Forty-year-old patient, suffers for six years from a very obstinate attack of muscular rheumatism, especially in the arms and legs; has repeatedly

used the Solbader Kur, but it is only through this year's emanation treatment that he has been completely cured.

No. 4.—Twenty-five-year-old woman patient. Has had articular rheumatism for three years, especially in the right shoulder-joint, so that it was barely possible to move it. Completely cured after six weeks' treatment.

No. 6.—Thirty-three-year-old woman, suffers for four years from lumbago in the right side, with a stiffening of the knee-joint. After ten weeks' treatment the patient can again move about without assistance and take short walks.

No. 7.—Fifty-year-old patient, suffers for three years from intercostal neuralgia on both sides and from muscular pains of the chest, and which often drove him to the use of morphine; relieved after seven weeks' treatment.

No. 8.—Forty-five-year-old patient, suffers for three years from lumbago. Cannot get up from sitting position unassisted. Completely cured after six weeks' treatment.

No. 12.—Sixty-year-old woman patient, has suffered for eight years from stiff joints in both arms and legs; she is completely helpless. After six weeks' treatment she is well enough to walk about alone and even to ascend stairs.

"We could continue to quote reports, but the above represents fairly well the results of our emanation treatments, especially in cases of gout and chronic rheumatism." . . .

We further quote the following excerpt of a paper read before the American Medical Association, June, 1913, by Drs. L. G. Rowntree and W. A. Baetjer, of the Johns Hopkins Hospital, Baltimore, Md.:

The consensus of opinion is that the use of radium is attended with an increased urinary acid output, and that disappearance of deposits is hastened. Uric acid disappears from the blood under radium treatment and appropriate diet, and its disappearance is frequently associated with subjective improvement. Grave doubt still exists, however, as to the mechanism whereby the undoubted therapeutic results in gout are accomplished.

The main point in the above is, of course, the evidently successful elimination of uric acid from the blood, and consequently from the tissues, and the relatively rapid recovery of the inflamed parts affected, even in cases of long standing, and never achieved by any other means.

But it is not alone in gout and rheumatism that radium emanations have proved so successful, especially, as mentioned before, in cases that have refused to yield to any other treatment. In myalgias, muscular pains, neuralgias, and in many cases of sciatica, not of hysterical and neurasthenic origin, they have proved equally applicable, probably because their remote origin lies in a uric-acid diathesis or in other metabolic shortcomings, and for that reason, perhaps, are corrected by the increased activity of the intestinal enzymes and

ferments. Not less important is the beneficial effect obtained in many cases of parametritis, or inflammation of the inner lining of the womb, a condition that is so hard for the gynæcologist to control; and, in referring back to the statement that radium emanations exercise a marked modifying effect on inflammatory processes, and that in this connection they also evidence bactericidal properties, we must not omit to add that this is, perhaps, in the way of inducing chemotaxis and thus influencing leucocytosis. We may therefore be led to believe that the application of radium emanations may extend to other internal, and especially chronic, inflammatory processes that now balk the skill of the most eminent physicians and that, in their nature, are beyond the operative field of surgeons.

As to the philosophy, or *rationale,* of the mode of action in general of radio-activity upon the system, there may be a question. It can hardly be that the alpha, beta, and gamma and, perhaps, other yet undiscovered rays act directly upon the various tissues and compounds in the body,—that is, in a chemical way, as, for instance, by a realignment of their ions, or a dissociation of their atomic groups, producing the various results observed; organic life is too complex for that, and some of the systematic effects can hardly be explained in that way, as, for instance, the induced changes in both normal and abnormal metabolism. The writer prefers to believe that the emanations of radium act by stimulating, or activating, the glandular organs engaged in the manufacture of active enzymes and catalytic and autolytic ferments, as well as the ductless glands, the so-called adrenal group, the thyroid gland, the suprarenal capsules, the pituitary gland, etc., and which largely govern the organic processes upon which life and the proper functioning of the body are dependent, the processes of constructive changes of nutritive matter and their proper absorption, and of destructive changes and their proper elimination. If that be the case, then there is hope that by further application of this new agent, speaking in general, arteriosclerosis and other symptoms of old age may be retarded, by preventing a too early degeneration of tissues, and thus good health and life be prolonged.

In the meantime, for what has already been achieved the world owes unlimited thanks to those earnest and patient workers who never appear as heroes.

And the future looks brighter.

ADRENALIN

BY LEONARD KEENE HIRSHBERG, A.B., M.A., M.D. (Johns Hopkins)
Baltimore

Truth needs no flowers of speech. Much of the Aladdin-like powers of the adrenalin extracts have been allowed to lapse into innocuous desuetude. Only the bleaching, blanching, hæmostatic, and pressure actions of this wonderful biological principle have been generally used in practical medicine and surgery.

The fact is, for instance, lost sight of that adrenalin injected into a frog causes a brief and useful paralysis of the higher cerebral functions. When even large amounts are used, recovery is almost certain. Cold-blooded animals seem immune from its fatal effects. Similarly, when given to mammals such as dogs, by the Appian way of the stomach, vomiting tremors and agitation may occur. Even in higher animals fatal symptoms are almost impossible to produce unless it is given hypodermically.

Adrenalin in practice has several virtues over digitalis, bufagin, and other pressure-raising agents. Given in emergencies of heart collapse, loss of arterial tone, or other sudden losses of blood-pressure, be the causes what they may, adrenalin acts more swiftly than the other drugs, and has the added virtue of passing off quickly; that is to say, its action is just transient enough to be in many cases useful, without remaining an obstruction after the desired purpose of quickly restoring blood-pressure has been attained.

The recent, almost dramatic experiments of Professor Cannon, of Harvard University, show the adrenal bodies and the extract from them to have a most important influence upon the emotions, as well as other hitherto unknown physiological processes.

A significant discovery of Professor Cannon has been applied practically in my clinics. He unearthed the fact popularly written up under the phrase, " You are sweetest when you are angry." This was, to wit, that in certain types of emotional stress, such as anger and fright, an excess of epinephrin or adrenalin is to be found in the

blood along with an increase of sugar. Indeed, glycosuria may be present.

Moreover, he found that in anger, which may be considered aggressive and offensive, and in fear, which must be regarded as defensive, the extra output of adrenalin adds not only to increased blood-pressure but to a shortened clotting power of the blood, rapid consumption of stored-up glycogen in the muscles and liver, and added strength and adaptability of the muscles themselves.

Professor Cannon does not put his conclusions quite so strikingly as this, but his researches show that the muscular power is enhanced, sugar leaves its reservoirs and begins to mobilize at the frontier points where it is needed, and there then appears the appropriate emotion consequent to the presence of the extra-adrenalin in the blood stream.

Obviously the practical bearing of the Harvard physiologist's investigation is to administer adrenalin hypodermically in such dull, listless, apathetic individuals whose sluggish muscles and inadequate blood-clotting power have kept them wanting in vigor, inefficient in their exertions, and subject to hemorrhages hitherto supposedly due to hereditary hæmophilia, jaundice, or any other ailment.

While not always successful, and with patients of this character too few as yet to report, I may say that doses of one grain of the powdered extract, or, when possible, fresh calf's, pig's, or sheep's glands, have upon two different patients reduced the coagulation time from four minutes to two minutes and from five minutes to one and a half minutes respectively. Two others were practically uninfluenced, and one very slightly—the time was reduced one minute.

Mr. F. W., 47 years, male, white. Physical, blood, and all examinations and tests without information. Blood-pressure, 130 and 90. Psycho-analysis negative, although he had been depressed, apathetic, and unable to extend himself physically for ten months. He was never known to be angry, to grow excited, or to be tense. His muscles and flesh seemed to be flabby, though he was well nourished. He had been to all the eminent, able psychiatrists, neurologists, internists, osteopaths, and homœopaths, not to mention other able and incapable, nondescript medical performers. Twice before he had returned to me. Psycho-analysis by the hour, the one-period and experimental psycho-physical tests the other time, were each only temporary makeshifts.

Before his third visit, Professor Cannon's experiments had become familiar to me. So Mr. W. was placed upon fresh calf's glands three times a day. One cubic centimetre of a 1 to 1000 adrenalin solution was also administered hypodermically once or twice a day as opportunity offered. The results were most happy. The treatment was continued ten days, with several days' rest, and then resumed. During the three months that have intervened, Mr. W. has become both physically and temperamentally a more vigorous man. His muscles are able to maintain sustained work, and there seems every indication that adrenalin alone has helped him.

SOME DANGERS OF OBESITY CURES

BY JAMES J. WALSH, M.D., Ph.D., Sc.D.

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THERE seems no doubt that there is going to be still more obesity in this country than at the present time, though there are assertions that we are already fatter, on the average, than most of the peoples of the world. Above all, the women of the better-to-do classes, with little to do and abundant opportunities for outing and air, yet without exercise and with overabundant nutrition, are becoming ever more and more stout, not to say obese. It is comparatively rare now to meet a woman above the age of forty who is not at least ten per cent. above weight, and a great many of them are twenty per cent. above their weight for height, which is the standard set by authorities for the distinction between mere stoutness and obesity.

The reason for saying that obesity is likely to continue to increase is to be found in the history of our sugar consumption. The statistical department of the United States Government in the Bureau of Agriculture pointed out recently that we are using more than twice as much sugar per head now than we were using twenty years ago, and we are probably using ten times as much sugar as Americans did a hundred years ago. The type of American that was recognized at that time, the tall, thin, Uncle Sam of symbol and his equally unrounded wife, was the product of a civilization in which the starches from vegetables and cereals supplied the sugar, and sugar itself was eaten sparingly. Sugar is a concentrated, artificial product in certain ways resembling alcohol, in the sense of being a manufactured and not a natural product. Sugar itself does not occur in nature, though the material out of which sugar can be manufactured by the system occurs abundantly in nature.

At the present time the world is using nearly 20,000,000 tons of sugar, though a century ago it used only a few thousand tons. We Americans are among the greatest consumers, and it is not surprising,

then, that, with highly concentrated nutritious material being used in ever larger and larger quantities, diabetes should be on the increase and obesity should be growing more frequent. The relation between these two affections is not completely understood, but they are manifestly quite intimately related in some way to over-nutrition by carbohydrates and occur much more frequently together than used to be thought.

With the increase of obesity will also come inevitably a multiplication of obesity cures. Particularly women who have allowed themselves to become over-fat by lack of exercise and indulgence of dainties of all kinds will insist on having their surplus flesh removed by artificial means and with as little trouble to themselves as possible. There are certain dangers in obesity cures, when they are practised radically, that it seems worth while to point out. During the past ten years a series of cases have been under my observation in which rather serious results have followed, or at least been so closely associated with obesity cures as to make any one who had followed their histories closely hesitate as to whether the serious consequences were not directly caused by the rather rapid loss in weight induced by the system of treatment which had been followed.

A little more than ten years ago certain proprietary remedies were very much advertised for the purpose of bringing about reduction in weight. An analysis of these showed that most of them were quite harmless mixtures, rather nauseating to the taste, meant to be taken before meals, but of no chemical significance as regards fat reduction. Whatever effects were produced was due to the directions to avoid certain foods and to take certain forms of exercise that went with them. Some of these remedies, however, held out in their advertisements the alluring promise so dear to the heart and the palate of the obese, that no diet was required with them, and actually limited the indulgence in foods to only a very slight degree, yet seemed to produce definite effects. Some, at least, of these remedies contained potassium iodide in rather notable amounts. My attention was called to one of them by a case of hasty consumption, true *phthisis florida,* which I was asked to see in consultation because of the question of admission to a sanitarium.

The patient was a young woman in service who had seen her mistress, who was not remarkably over-stout, taking some remedy that

was supposed to reduce flesh. She herself had been gaining in weight and was distinctly fat, though not obese, and thought that the remedy ought also to do her good. Her mistress went away during the summer time, leaving her in charge of the house, and, thinking that if a little of the remedy was good, a good deal of it ought to be better, she took it in considerable quantities, her mistress having several bottles of it in the house. Besides being alone, the girl thought it a good chance to save herself trouble by limiting her meals to two and having one of the meals consist of several cups of tea and some toast, with occasionally an egg. Quite needless to say, it was not long before she began to lose in weight. She had weighed 165 pounds and she came down twenty pounds in the course of a month, and, having very little to do in the house during the summer time, she did not notice how weak she was, spending a good deal of time, indeed, in bed every day.

After a time she developed a cough, which gradually grew worse, some fever developed, and at first she thought that she had only one of the " summer coughs " that proverbially are supposed to hang on so long. Summer coughs that hang on are always suspicious. The reason why they hang on usually is that there is an underlying pulmonary tuberculous condition. The old expression that " summer coughs hang on " often proves sufficiently satisfying to people to make them neglect a cough until often there are serious developments, and that was what happened in this case. When she went to a physician she was already suffering from rather extensive involvement of both upper lobes. Very shortly there was a generalization of the tuberculosis, and in the course of some three months the case proved fatal.

I have always felt that in this case an otherwise quite healthy girl probably had an old lesion of tuberculosis well encapsulated, but in the rapid loss of weight which followed the use of the potassium iodide preparation and her greatly reduced diet this encapsulation gradually broke down or was weakened in its protective properties. With her very insufficient nutrition and the alterative effect of the drug it was not very long before the tubercle bacillus was growing luxuriantly. We have learned now that practically every one has a focus of tuberculosis somewhere in the body, for statistics show that at the autopsy of the bodies of persons over thirty years of age who die of some other disease than tuberculosis there is always an active or inactive tuberculosis focus. Sometimes this latter is represented only by adhesions

somewhere in the body. It is generally admitted now that tubercle bacilli may live for a long time encapsulated in the tissues and yet have vitality enough to begin growth again if there is an opportunity. Apparently the opportunity was afforded in this case and rapid growth began because conditions were favorable.

Tuberculosis constitutes, then, an ever-present danger in obesity cures. The tendency of the tubercle bacillus to develop, particularly in those who are under weight, is sometimes thought to represent some special affinity of the bacillus for tissues without fat. The conclusion would seem to be confirmed by the fact that putting on weight represents the best possible means of combating the progress of tuberculosis and the growth of the bacillus. Indeed, it is probable that the so-called hereditary tendency to tuberculosis which causes it to run in certain families is scarcely, if at all, more than the characteristic of the members of that family to be under weight. In nearly all of these cases an analysis of the eating of the family is interesting and has always seemed to me most important. Thinness is supposed to be a family trait in many cases, and patients will tell their physician that they are under weight, but can scarcely hope to be heavier, because father or mother, whom they resemble, as the case may be, or perhaps both, were inclined to be thin. A little questioning usually elicits the fact that such people are eating very insufficiently. Almost as a rule they take a very light breakfast. It was a family habit to have only coffee and rolls, with sometimes an egg, for breakfast, and not infrequently such people eat rather scantily, or certainly below the average, in the middle of the day. They are quite confident that they eat enough because they have a very good appetite for their evening meal, and they eat that abundantly. Sometimes it will be found that, of the other two meals, one is an apology for a meal and the other cannot by any stretch of the imagination be called a meal at all. It consists often of nothing more than a little something to drink, with a slight amount of some cereal substance to give a little chewing variety. What really runs in the family in these cases is a bad family habit of eating.

The tubercle bacillus develops by preference in tissues that are undernourished, hence its affinity for the thin and hence its liability to find a foothold, or for an old focus of the affection to be lighted up whenever the patient is receiving insufficient food. This is not an

exaggeration, for a great many of the young folks who develop tuberculosis give the history of having been losing weight for some time just before they caught the cold that hung on. Sometimes the story is that they overworked or overworried, and ran down in weight as a consequence. What really happened in most of these cases was that preoccupation of mind with work or worry led to neglect of meals or took away the appetite, and then the tuberculosis obtained a chance to develop. Usually it is thought that the running down in weight is due to the growth of the tubercle bacillus, but any one with any experience in the management of tuberculous patients knows that, almost without exception, just as soon as positive directions are given to eat certain amounts the patient begins to gain in weight. It is a failure to eat, and not a wasting of tissue, or even so much a lack of appetite as a failure of proper habits of eating that must be set down as the cause of the loss of weight.

There is another set of cases that are even more serious than those of tuberculosis, with regard to which it is very difficult to get away from the idea that loss in weight has been a prominent direct factor in the etiology of very unfortunate developments. Psychiatrists know that in the history of a great many patients suffering from the various forms of melancholia, or, as we now call them, the manic-depressive conditions, there is a history of marked running down in weight shortly before the first severe manifestation of the mental symptoms. The other experience is quite as common and seems to confirm the previous observation that just as soon as these patients can be made to gain in weight, most of them begin to improve in mental health, and by the time they have reached a little above the normal weight for their height they are often in excellent mental condition. When there is a relapse of their mental symptoms the preliminary sign of it is usually a running down in weight.

We have come to recognize very definitely that practically always depressive conditions occur only in families in which there is an hereditary element. In not a few cases, however, there has been the most perfect mental health well on beyond middle life until for some reason there was a serious running down in weight. Twice in the last ten years I have been startled to find patients who have been known to me as thoroughly capable intellectually in whom, after a severe reduction cure in which they lost a large amount of weight, in

one case some sixty pounds in the course of about six months, severe mental symptoms developed. One of them was a school teacher who, getting to weigh two hundred pounds, though only five feet eight inches in height, feared the consequences of further gain and took an obesity cure. This consisted of coffee and a roll for breakfast, a cup of tea and some crackers at luncheon, and a reasonably abundant dinner, from which, however, practically all the starch-containing vegetables were eliminated. Quite needless to say, she ran down rapidly in weight, but when she had lost thirty-five pounds mental symptoms began to show themselves and she has never been quite herself since.

A second case was that of a man of about the same height, five feet eight inches, with a distinct liking for the good things of life, who found himself growing rapidly heavy when near sixty, until his weight reached 260 pounds. His girth became a subject of joke to his friends until it "got" on his nerves. He became very much disturbed over it, and was quite ready to take any trouble or to go to any length in order to reduce his weight. He was put on a strict regimen which reduced his breakfast to the lowest terms, made lunch a glass of milk and a cracker and eliminated most of the starches and fats, and the surprise was that he was able to stand it so long. My own experience is that after a time men, particularly, and, above all, when their pride has been touched, develop a sort of passion for following out the dietetic system that is dictated to them, no matter how hard it may be to keep up, and when they begin to note that they are rapidly losing in weight they do not mind how much annoyance and ill-feeling it may cause them. This man lost some sixty pounds in less than six months. He began to have dread and extremely depressed feelings, but continued his diet for some time longer until he weighed 195 pounds. By that time he had a fully developed type of manic-depressive insanity.

This patient had been for nearly sixty years an active intellectual worker, sharing in the amply strenuous life of a large city, had been the consulting engineer for some very important construction work, had within two months of the time when he broke down completely in mind passed on certain plans for a great engineering work with regard to which a number of his immediate assistants disagreed with him, yet which were approved by distinguished engineers, subsequently

called in consultation, and successfully carried out while he was in the asylum. All his life he had been noted for his grasp of important questions and his power to settle them for himself, often when there were no precedents to help him. I can scarcely help but think that in this case the reduction cure, too severely pursued, was a prominent factor in the bringing about of the unfortunate mental state.

It is easy to understand that when weight is taken off very rapidly in this way the drain is not always on the fat tissue, which is, after all, rather poorly supplied with blood-vessels and therefore does not readily find its way into the general circulation for nutrition purposes. The fat in the abdominal region particularly and in the bust in women is so thoroughly segregated from the system as to remain in considerable quantities even after other tissues lose very much of their substance. It is particularly these portions of the body that patients would like to see reduce as rapidly as possible, but any such consummation, however devoutly to be wished, is not easy of accomplishment. The absorption takes place but slowly with the aid of massage, exercise, pressure, and other physical means that keep constantly tempting some of the fat to enter the general circulation or mechanically help in its absorption.

When reduction is rapid, then important tissues are likely to be drained of their nutrition, and in spite of the fact that there are large stored-up supplies of material within the body, these are so segregated as not to be readily available. What seems to happen in many cases, and especially in persons who are very fat, is that important nerve tissues on which mental equilibrium is dependent lose so much in nutrition that their function is seriously disturbed. Anything that in persons with defective mental heredity causes rapid reduction in weight is likely to be dangerous. On the other hand, the observation is universal that if melancholics were thin when the metal symptoms first manifested themselves, almost immediately after they begin to gain in weight they improve and the prognosis is always much better than it would otherwise be.

Another series of affections, though they appeal to me rather as symptoms than as actual pathological conditions, are various muscular pains and aches which are complained of, especially after there has been rapid reduction in weight. Usually they are spoken of as rheu-

matism. They occur very commonly in the neighborhood of large joints or in groups of large muscles, as in the back or the neck, especially the posterior cervical region, or in the legs. They may be noted, however, in any part of the body if there is considerable use of particular groups of muscles in some ordinary or extraordinary occupation. They are often treated with so-called rheumatic remedies, the coal-tar products, which lessen pain and discomfort and therefore seem to confirm the diagnosis rheumatism, but they are really due to the fact that the muscles have not sufficient nutrition to enable them to do their work properly. The consequence is that a muscular strain that is painful, or at least uncomfortable, develops. Sometimes these pains are attributed to the fact that when there is a considerable reduction in diet constipation is likely to be noted, and then they are supposed to be due to some form of auto-intoxication, because there is not sufficient intestinal evacuation. Sometimes this constipation and sluggish state of the bowels is really due to the fact that the patient has been counselled to drink less fluid than before, and, as a result, the contents of the intestines are not soft enough to be readily moved along the intestines or to be evacuated. These painful muscle conditions are often quite marked in the old. They are often exaggerated by the fact that if after a period of inactivity for any reason an elderly person begins to walk there are always muscle pains that seem to have some pathological significance beyond mere tiredness. They are really the muscular aches that are always noted when unusual muscular exertion is taken, but they seem much more than this, and, as they are worse in rainy weather, they are often diagnosed as rheumatic and various rather disturbing and powerful rheumatic remedies are given. In our time rather large doses of aspirin are likely to be prescribed; ten years ago it would have been some of the salts of the salicylates, and twenty years ago salicylic acid or wintergreen oil. Above all, the diet is regulated, the red meats are excluded, all the acids are taken out of the dietary, and a general reduction in the amount of eating advised. Thoroughly scared by these directions, the old people sometimes eat so little that they suffer from vertigo and tendency to faintness as a consequence. These symptoms of inanition are then attributed to some disturbances of the cerebral circulation, and anxious solicitude is aroused in friends and in patients themselves.

I have seen this picture develop so often that I do not hesitate to emphasize the absolute lack of thought with regard to the true condition which characterizes this mode of treatment. The disturbance of nutrition still further emphasizes the pains in muscles and around joints until serious rheumatic developments begin to be feared. The only clinical rule to remember in these cases is that there is no rheumatism unless there is some fever, and that the so-called rheumatic muscular conditions are, almost without exception, local and due to temporary conditions. Muscle pains are the sign of wrong use of muscles or of the use of muscles after inaction, or of actual starvation of muscle tissues, as in severe reduction cures. They have no pathological significance unless there is some inflammatory condition associated with it. The pains and aches that develop after hard sport or mountain climbing or descent into mines for sight-seeing purposes, when the visitor is unused to such exercise, must not be forgotten. Very often inexperienced travellers are sure that they must have caught cold, but after a few days the condition clears up. If for any reason there is a limitation of diet in stout people because of the development of these pains, the aches are almost sure to be rendered enduring and are never benefited by dietetic treatment, though it is almost the rule to begin diet tinkering in these cases, above all in the line of reduction of diet, which often proves harmful.

A favorite old-fashioned maxim in reduction cures is that the patient must take much less of fluids than before. The old Banting cure so popular in England insisted particularly on a dry diet as a great help to reduction in weight. This is one of the old traditions, like that of the difference between red and white meats, for which it has been very difficult in our time to find any scientific confirmation. Most of the old traditions with regard to drinking at meals have been seriously disturbed in recent years. The tradition, for instance, that taking a quantity of fluid at meal time hampers digestion by diluting the gastric juice has proved to be entirely founded on theory, but is contradicted by experimental observation. Digestion proceeds a little better if a considerable quantity of fluid is taken than if only small amounts of fluid are consumed. Unless there is dilatation of the stomach, there is no more discomfort in digestion with considerable fluid than when much smaller quantities are taken. It has been found, however, that food is absorbed and serves the purposes of nutrition a

little better when taken with considerable fluid than when the fluids are limited. On the other hand, the absence of fluids renders the movements of the bowels sluggish and throws more work on the kidneys, for water is the best diuretic that we have.

There is a growing conviction in the minds of many physicians at the present time that the old tradition with regard to the absence of fluids or strict limitation of them at meal times and in between meals comes to us more from the experience of trainers for the prize ring than from any strictly medical observation. Even trainers, however, no longer limit fluids nearly so much as was once the custom. There is no doubt that for the rapid reduction in weight that a pugilist often needs in order to bring him down to a certain limit in a definite three to six weeks of training the limitation of fluids will do much. It causes a rapid loss of weight during the first week or ten days because it drains all tissues of fluids, but then a fluid equilibrium asserts itself. During the forty-eight hours immediately preceding the "weighing in" absolute suppression of fluids is a trainer's trick, for fluid is very heavy and sometimes a pound or two make a very great difference at this time. For a man who is taking vigorous exercise the limitation of fluids leads to the hardening of muscles, and this was a desideratum for prize-ring training. For ordinary reduction cures, however, it is probable that too strict limitation of fluids does harm rather than good, and it is doubtful whether it is ever helpful in bringing about such removal of fatty tissues as is the consummation most to be desired in the treatment of obesity.

I have in mind the histories of some cases in which reduction cures were followed by the first symptoms of a nephritic condition that afterwards proved serious. The strain thrown upon the kidneys was apparently too much, though they had been able to bear the burden of ordinary elimination before without showing any signs of deterioration. The kidneys were not normal before, but were quite equal to normal excretion, but failed under the added strain in the absence of fluids.

Almost needless to say, a reduction cure should never be undertaken without a careful study of the urine, not alone for symptoms of nephritis, as well as for diabetes—for obesity and glycosuria often run together—but also for any signs that the intestines are not doing their work of elimination properly, or that a considerable burden of

intestinal excretion is being shifted to the kidneys. The presence of indican in the urine, especially if combined with increased amounts of solids, must make it clear that the ordinary dietetic regulations for reduction cannot be dictated. If such a patient is asked to cut out most of the carbohydrates and lives largely on meat and other proteid materials for any considerable period, there may be a serious result.

Reduction cures should not be undertaken when people are far beyond middle life. Every physician has seen sad results as a consequence of attempts of this kind, though they are much oftener the result of foolish efforts of the patient himself, undirected by the physician, than when under proper medical care. Sometimes it happens that an old gentleman, retired from business, finds himself increasing rapidly in weight, or perhaps wakes up to the realization that he has gained much more weight than seems to be good for him. He reads somewhere that the people who attain old age are usually those of spare build, and, while he has never been of that habit of body, he dreads the effect of his overweight on his health and attempts to bring it down by the general advice of friends and what he thinks he knows about the matter. Whatever may be the case with a young man, an old man who has himself for a physician has a fool for a patient. Not infrequently serious results follow, and the object of prolonging his life is defeated by the very means that he foolishly took in order to accomplish it, though it cost him no little self-denial to maintain the dietetic regulations which he made for himself. Nowhere, perhaps, is Josh Billings's remark more apropos than in these cases, that "it would be better not to know so much than to think we know so much that ain't so."

With regard to the tradition that the people who are over weight do not live long, there is much that is not true. While those who are greatly over weight are likely to die in early life, not a few of those who reach the age of eighty and some of those who reach the age of ninety are from ten to twenty-five per cent. above their weight for height, and some even more than that. People who have been inclined to be over weight all their lives, and who come from a long-lived family, may look forward with reasonable confidence to life beyond seventy, provided they keep themselves from becoming so obese that exercise is difficult, and do not permit themselves to be tempted to too great inactivity. The attempt at dietetic regulation of any kind for old

people is usually a serious matter. After all these years of life, their own experience is probably a much better guide than any theoretic considerations that a physician may attempt to apply to their case. Above all, marked reduction in the diet of a lifetime, with prohibition of favorite simple foods, is nearly always followed by unpleasant symptoms and must be avoided so far as possible. The principle *non nocere,* to be sure to do no harm, is, above all, of importance in these cases.

SOME NOTES ON ASIATIC CHOLERA; ITS PREVENTION AND TREATMENT

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The following article, founded on practical clinical observation made on several thousands of cases of cholera seen by the writer during five years, occurred when there were two epidemics of the disease in Siam, and sporadic cases all the time. As cholera is now prevalent in Europe, the topic is a timely one, as there is danger of the United States becoming infected with the disease.

Asiatic cholera, when transplanted to other parts of the world, especially to temperate climes, seems at times to lose much of its original virulence, due probably to an attenuation of the bacillic poison, while in India, China, Burmah, French Indo-China, Siam, the Malay Peninsula, and Java it seems to retain its full power and vigor to destroy life. As a rule, the death-rate in other countries, while bad enough, is not so heavy as in its original home and habitat. This, however, has its exceptions, as shown in the epidemic in Hamburg, Germany, some years since, when many thousands of people died in a few days, the origin of disease being an infected mattress on which a cholera patient had died, and which was thrown into the harbor from a vessel on arrival from an infected port.

Of course, all attention should be paid at port of entry to strict quarantine of ships from infected countries during the prevalence of cholera, and also to the drinking supply of inhabitants of this country, which should be carefully guarded from accidental infection; but I think in the past too little attention has been paid to the part the common house fly or other variety of fly has taken in the transmission of the disease from infected material to man.

In my own experience, covering a period of five years, it happened that, after every precaution had been taken by proper sanitation and boiling the water supply, cases still occurred, and this was traced to the flies carrying infection to food, especially where care

was not taken of the latrines, and usually in such institutions as barracks, jails, asylums, etc., where large bodies of people congregate and large quantities of food are prepared at one time.

For instance, in the town jail of Petchaburi, in southern Siam, in a particular lot of prisoners confined together, forty out of a total of seventy died in two hours of malignant cholera, the other thirty escaping entirely—a mortality of 100 per cent. of those attacked. The men who were ill had no treatment. Of the remaining 300 prisoners, fourteen were taken with the disease that day, of whom four died and ten recovered with treatment; but with strenuous measures, all drinking water was boiled, all bowel movements disinfected, latrines disinfected, and all food covered carefully from flies. There were no more cases. If cholera should unfortunately come to this country, following the war in Europe, it would be necessary for a general "swat the fly" campaign, and the covering of all food products in stores and public markets, so as to prevent infection from flies. As the discharged vomit is as dangerous as the bowel movements, and attracts flies at once, and patients are often taken ill in the public streets, the exposure of food becomes a double menace.

A good water supply and sanitation are necessary always, but in cholera time only boiled or distilled water should be taken, and in the Far East we never eat fish in the cholera season. Let great attention be paid by the individual to the digestion, and only easily digested food taken, rich food being avoided. A person with good acid gastric juices often escapes under the same conditions that a person with poor digestion is stricken—this owing to the fact that the cholera bacillus is destroyed in acid solutions. Hence, in cholera time, all the Europeans drank great quantities of lime juice and lemonade, or, as in Hamburg, aromatic sulphuric acid—well diluted. Another clinical point was impressed upon me early in an epidemic of cholera, and this was the danger of prescribing saline purges to anyone who needed a cathartic, even in good health. After the bowels were opened freely with salines there was no stopping them.

Some European physicians gave large doses of calomel as soon as the first symptoms showed, but the patients all died. I never knew one thus treated to recover. To those not familiar with the disease I would say that in one epidemic in Siam I certified to 2000

deaths in less than sixty days, although I did not personally attend all of these cases, many being attended by my staff of assistants. Fifty-three cases in one day was my best record. In the town of Pak Penang, in the Malay Peninsula, with a population of 2000 souls, 400 died inside of ten days after the first outbreak. When I arrived the outbreak was under control.

There is immunity in Asiatic cholera as in yellow fever. In the latter, in the tropics, the non-immunes are the newcomers to the country. It is also so with cholera. The people in Bangkok, a city of 600,000 people, bathe in filthy klongs or canals of the city, drink filthy water from babyhood, the custom being to bury persons dying of cholera, instead of cremating them; and therefore the water is infected a great part of the year. Very few of the Siamese born and raised in Bangkok get cholera, unless there is a general epidemic, but the visitors from the Malay Peninsula, the Chinese coolies from China, and the Laos and Karens from the north of Siam are the usual victims when moving to Bangkok or visiting the city, and this I quote from personal observation. There is always some cholera in Bangkok, but, of course, always worse in the dry season. At a time when there was *no cholera in the city* a governor of one of the Malay Provinces visited the town with a large retinue of Malay servants, who were used to the clear mountain streams of the peninsula. In ten days the whole retinue were dead of cholera. The Sultan of Kedah, with a large retinue of officers and servants, went through the same ordeal. I attended these people, and saw this also occur to many others. It is a common saying in the north of Siam, "If you go to Bangkok you die" of "Ahi Wa Ta Roke" (literally, "that dreadful disease"), the Siamese name for cholera. The inhabitants in the course of their lifetime have, to a great extent, become immune.

Cholera of a severe type, as met with in the Far East, causes death very quickly, often within one or two hours from onset, and this evidences a curious difference between the white man and the native. The white man, as a rule, with a higher intelligence, realizing the great mortality and danger, and not having the fatalistic ideas of the native, nearly always gives up and dies promptly, while the native gets well with the same treatment, the mind having a great deal of influence with the vitality of the patient when that vitality

is very low. In milder cases of the disease death may result in from ten to thirty-six hours.

Prompt and extreme treatment is necessary. So far as vaccines or serums are concerned, I never saw any good results, although there is no need to doubt that along this line success will eventually come. In Saigon the French have issued cholera serum, but, in my opinion, it was not efficacious, and during the last epidemic of cholera in St. Petersburg, Russia, the reports that I received said it was not satisfactory.

So far as transfusion was concerned, this did not prove satisfactory, either. When Dr. Adamson (Inspector-General of Hospitals) and I used it, it undoubtedly prolonged life, but the patients usually died later of uræmia. In institutions, jails, barracks, asylums, etc., where the patients are on the spot, and where all of the appliances are convenient for operation, transfusion may do well, but it is not practical for general use. The patient dies before real use can be made of it, although when they have been *in extremis* I have seen it prolong life for several hours. It was not practical, either, in general practice in the tropics, but, of course, would be more so in America, where facilities are more convenient.

My great belief, however, is that it is far better to keep the blood where it belongs—in the blood-vessels of the body—and not wait until, by leakage into the stomach and intestines, the blood is practically denuded of its fluid contents, and then by transfusion to replace the fluid contents of the blood with saline solution or plain warm water. I repeat, " Keep the blood where it belongs."

Now, in cholera, prompt treatment is necessary to overcome the following conditions: First, the profound toxæmia. In malignant cases many die from the shock of the poison in an hour or two; often a patient becomes unconscious in fifteen minutes from onset or may drop dead in the street. This occurs in people with weak hearts. The bowels may not move at all, but on post-mortem the intestines are found to be filled with rice water fluid. Death occurs frequently after a couple of bowel movements. The symptoms are the same as in cobra bite—cold sweats, pinched features, sunken eyes. Another condition is when the patient is tided over by some strong stimulant or survives the shock himself, and there occurs the dehydration of the body by loss of the watery constituents of the

blood by leakage through the walls of the stomach and intestines. The man bleeds to death as surely as if his arteries were cut. The body shrinks in size; from the stomach is ejected rice water fluid. The pure serum of the blood is ejected as if the patient had taken an ipecac emetic. Rice water fluid flows continually in a thin stream from the relaxed bowel. He loses many pounds in weight in a few hours. The cramps then come on and the patient writhes and twists in agony, and the muscles of the arms and the legs are drawn up in knots.

Thirdly: At this stage the kidneys strike work and uræmia sets in. In my experience, the greater number of patients died in this stage. Now, at first, when I saw that of this type *all of my patients promptly died,* in desperation I increased the dose of remedies, realizing that the fluids of the body being poured out prevented absorption, so that to get results enormous doses should be used. By doing so the patients lived a few hours longer, and then I threw discretion to the winds and gave doses that seemed incredible, and my patients recovered. I owe much to Dr. Adamson in this matter, as he had a large experience of many years' practice with the disease.

The results obtained by this treatment were so remarkable that we received the thanks of many whose lives were saved and who are living and speaking witnesses of its efficiency. Two of the proudest moments of my life were, first, when we showed the Siamese officials ten children successfully vaccinated with smallpox vaccine that we had made—the first made in the kingdom of Siam—after an epidemic of smallpox with 10,000 deaths in the country; and, secondly, when 300 prisoners in one of the jails thanked the "Moh Luang" (the King's doctor) for saving their lives in a cholera epidemic.

Our treatment was as follows:

First, to prevent vomiting so as to retain the remedies. A large dose of tablets containing cocaine, creosote, and cerium oxalate was given to the patient, who was told to chew them up thoroughly.

It must be remembered that all preconceived ideas of dosage must be given up in Asiatic cholera. A few minutes later one or two tablets of the following formula were given, the patient being directed to chew these up, so as to get quick results:

Morphine sulphate	⅙ gr.
Hyoscyamus	⅛ gr.
Nitroglycerin	1/100 gr.
Citrated caffeine	½ gr.
Capsicum, Camphor, of each	¼ gr.
Tincture of digitalis	5 drops

Very frequently at this time no pulse can be felt except in the axilla. Every few minutes, until the pulse can be felt at the wrist, the tablet of digitalis and nitroglycerin (digitalis, 2 minims; nitroglycerin, gr. $\frac{1}{100}$) is given; so soon as the pulse is felt at the wrist, no matter how feebly, the prognosis is more favorable.

Now is the critical time in the case, and he who hesitates is not lost, but he will certainly lose his patient unless he gives nitroglycerin and digitalis for effect. I have given as high as *twenty to thirty tablets* in a few hours with splendid results.

In the meantime the patient is given the following mixture as a stimulant and diuretic:

Tincture of eucalyptus	4 ounces	fluid
Spirit of camphor	2 drachms	
Tincture of capsicum	30 drops	

This is taken at one dose, diluted with an equal amount of water. Then, to keep the kidneys active, doses of a teaspoonful to a tablespoonful of tincture of eucalyptus are given every hour until reaction has set in.

Mustard plasters and heat to the body were not neglected. These remedies stop the vomiting, produce reaction, and combat the toxæmia.

In the meantime the patient is bleeding to death internally by the leakage of the serum of the blood into the stomach and intestines. To keep the blood-serum where it belongs—in the blood-vessels—I used large quantities of tannic acid in a modified form (protan). I have given the equivalent of 120 grains of tannic acid in twenty-four hours with the happiest results, giving it in ten-grain doses after each bowel movement, or every hour, irrespective of the bowel movement.

A great many patients promptly react, and the uræmia is combated by the digitalis, caffeine, and eucalyptus that have been given. The most vital treatment at this point is the absolute prohibition of all food for thirty-six hours or longer. This must be absolute. I have

known relapses to occur after taking a slice of orange or teaspoonful of soft-boiled rice. Why this should be so I do not know. Vomiting and diarrhœa at once begin and the patient dies quickly.

The recovery is rapid if complications do not occur. In some cases the family on my arrival at the house informed me that the patient was dead. Inside of a week the supposed dead patient was walking around, although very weak and feeble. In hundreds of cases this treatment met with the greatest success. The usual treatment of every European physician in that part of the world is to give a big hypodermic of morphine to the patient, who promptly is relieved of his pain and dies as promptly. We never gave opium in the later stages of the disease at all, and in the early stages only in connection with doses of strong heart stimulants.

In conclusion, cholera can be kept out by rigid quarantine and be controlled by boiled water, strict sanitation, and food protected from flies, and many cases can be cured by prompt and heroic treatment, and in the future I believe that the situation will be controlled by serum or vaccines.

HOME AND OFFICE TREATMENT OF INEBRIETY

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The home treatment of inebriety is confined to occasional calls for medical help, as in cases of intoxication and delirium. When the symptoms are unusually alarming or the patient unduly stupid, wild, and maniacal, medical men are called.

In all large cities a considerable amount of the early practice of physicians consists in treating persons in this condition. Many large hotels employ physicians whose principal work is treating acute stages of alcoholic intoxication. Even now physicians retain the old theories and prejudices, and deem such persons vicious and reckless, and that they should be made to suffer for their folly; hence the treatment is mixed largely with narcotics and moral remedies. In general practice, in chronic cases suffering from extreme conditions, where the causes are not recognized, the conditions only are studied.

The opening of Binghamton Asylum in 1864, the first institution in the world for the treatment of inebriates, attracted a large crowd of the practically incurable, who were both skeptical and credulous, but the experimental work done proved inebriety and alcoholism curable in the largest sense of the word. From that time institutions of all grades and degrees have confirmed this, indicating an early stage of curability, and pointing out possibilities of prevention by removal of causes and active treatment known only to specialists.

Two conditions are included in the terms "alcoholism" and "inebriety": First, the alcoholic is simply a toxæmiac from alcohol. There are congestion, auto-intoxication, cirrhosis and chlorosis, and a most complex variety of perversions which may be both local or general. The constant drinker is an alcoholic, whether he drinks to stupor or not. Constant use of spirits keeps his system charged with toxins and prevents elimination and restoration. There are many persons of both sexes, deeming themselves "temperate," who drink

wine and beer and spirits at the table as a beverage, or at regular intervals as medicines, that are, literally, alcoholics.

But the inebriate represents a different phase of disease. He uses spirits for their immediate narcotic effects, and when this is secured he abstains. The term " periodicity " describes an extreme stage in which persons at intervals drink to stupor and narcotism and then stop. The free interval is one of restoration and recovery. A great many belong to this class, and use spirits only for their pleasing narcotic effects. These seldom call on physicians until they reach a chronic stage, or until something very unusual happens and they cannot stop themselves, the drink craze continuing beyond their control.

The feeling of alarm extends to the family, and the physician is called. Many of these patients are from the very best families, who are dependent upon the physician for counsel in almost every condition of life, and, when forced by most unusual circumstances, turn to him for help with pathetic eagerness. The physician is often distressed at his inability to do more than advise moral remedies and training of the will. If he gives opium or any of the narcotics, there is peril, and he realizes that drugs are not competent to cope with the condition. If he tries placebos and remedies laid down in the books there are uncertainty and failure; and, finally, if he allows the patient to take secret drug cures in institutions far away, they may return restored and emphatic in their praises of such places, to his distress, for he is certain no new remedies have been used, and these so-called curers are not medical men or leaders, so cannot possess anything that is new. Thus physicians, as a class, feel regretful that charlatans, by mysterious methods and means, have been able to do more than they could with all their knowledge and training. On the other hand, there is a consciousness that philanthropic and reform efforts are failures, and court measures, by fines and imprisonments and threats, also fail, so the physician is placed in a very anomalous situation. He is called on for help only in extreme conditions and stages of chronicity, yet is conscious that these poor victims, in almost every neighborhood and in the families of his friends and associates, are suffering from nerve and brain disease which could and should be prevented.

The claims of quacks to have found remedies are unsupported,

although a certain number of persons who use these means recover, and certain prescriptions are followed by occasional restoration, but they are unsatisfactory. A few specialists urge that all these persons could and should be treated in the early stages at home, the family physician, of all others, to be most competent for this work.

An outline of such treatment may be as follows: First recognize that the drink victims are not suffering from moral disorders, but veritable, physical and mental symptoms of degeneration and poison; also that these diseases follow a regular, uniform line of cause and effect, the same as other diseases. The inebriate exhibits symptoms allied to insanity, epilepsy, hysteria, and other convulsive neuroses. There are nerve fatigue and irritation, for which alcohol is the most grateful narcotic. The causes are, very largely, heredity, which means low vitality, special inherited weakness, and inability of control. On the other hand, there may be retarded brain growths, resulting from faulty nutrition, diseases, and predispositions. Traumatisms occupy a large place, such as injuries, concussions, shocks, and wasting diseases; also there may be overwork, underwork, imperfect sleep, worry, and emotional disturbances. Then come sexual excesses, nutrient excesses, starvations, all producing perversions and all centring in profound fatigue and irritation. These are the conditions which provoke the use of alcohol. After a time the narcotism from alcohol is so grateful that it becomes convulsive in its demands and irresistible. Then comes the periodic drinker, who, under all conditions, craves the narcotism from spirits and is not satisfied until he secures it. In these there is not only poisoning, exhaustion, and starvation, but local and general degenerations.

The alcoholic has these, and, in addition to continuous paralysis, vasomotor, sensory and functional, subacute inflammations and reflex irritations. The heart and its functions are deranged; the stomach suffers; neuritis of the extremities, apparent in so-called rheumatisms, and neuralgias are common.

These are general conditions, more or less pronounced in every case. Home treatment, as in institutions, is the removal of causes. Any general study will indicate how far alcohol is an active or predisposing one, or how far it is a mere symptom. The removal of alcohol by substitution is very simple. Probably the strong infusions of cinchona or quassia, or any similar bitters, given in one- or two-

ounce doses every hour, will be quickly followed by profound disgust for spirits. Sometimes, where the mind is deeply impressed with the value of the good effects from alcohol, emesis will break it up. Apomorphia is a very good drug for this purpose. It produces profound relaxation and seems in many ways to change impressions and memory.

Quacks frequently give spirits containing tartrate of antimony or ipecac for this effect, coupled with the suggestion that spirits can never more be taken. This is not a safe method of treatment, and should be used only in an emergency. The first treatment should be eliminative, particularly by means of baths, in which bicarbonate of sodium in the water can be used freely. Cathartics in the form of sulphate of magnesium are valuable, and when this is carried on for two or three days the most pronounced reaction follows. A remedy found very useful in strychnine is $\frac{1}{30}$-grain dose every three hours. This may be combined with $\frac{1}{200}$ of atropine. In a few days this produces a marked change. These means, changed from time to time, make a very profound impression on the organism. With the coöperation of the patient, and the careful control of diet and hours of rest, and such mental treatment and teaching as required, the best results will follow. In the treatment of the comatose case, usually of an alcoholic, and where the physician has not had time to acquaint himself with all the circumstances, hydropathic measures, warm baths, with vigorous rubbing, and cold applications of water to the head and spine, are the most powerful stimulants.

Let bitter tonics with salines be used, until a free action of the bowels follows. Narcotics should be given with great caution, and chloral is uncertain. Opiates of any kind may be given, but their use should be concealed from the patient. They may suddenly concentrate and produce heart-failure if he be delirious, so they should be withheld and the milder narcotics substituted. Of these, lupulin, valerian, asafœtida, and others of this class allay nerve irritation with greater safety than other narcotics. Hot milk, hot acid drinks, and some maltine preparations may act in the same way, if borne by the stomach. If there be unusual stupor or delirium, great care should be exercised in the use of narcotics. Let hydropathic measures of every description be given and persisted in, and when

head injury is known to be present hot packs and measures addressed to the surface of the body are most practical.

When the evidence indicates great drink excess, toxæmias are to be treated very resolutely by elimination. On recovery from the delirious stage, the condition is one of exhaustion, so let foods and tonics be given. Mineral baths will often be almost a specific. The patients are made to recline in water charged with salt, bicarbonate of sodium, or acids, of the temperature of the body. If this is not practical, vigorous rubbing may be substituted. When acute symptoms subside, then a history of specific disease calls for mercury, which can be given in large doses at the start; also arsenic and the iodides are all very excellent remedies for particular conditions.

When the facts indicate exhaustion, the gravity of the case should be impressed on the patient's mind, and, while drug taking should be almost *nil,* placebos are often essential to keep up the patient's confidence in tangible measures. Of the salines, probably the sulphate of magnesium, in small doses, is the most valuable. Where a history of neuritis and obstinate dyspepsia has been associated with the drink craze or alcoholism, baths, nutrition, electric currents, and a great variety of means and measures found to be useful under the circumstances, must be given. There should be no effort to do more than to restore the metabolic processes of the body, and narcotics of any kind are more or less dangerous.

In elderly persons who have drunk more or less for several years, and who suddenly have become intoxicated, the gravity of the situation must be recognized and the most radical measures instituted at once. Often a change of surroundings and a residence of a few months in a sanatorium are invaluable, but they should be constantly under the physician's care. The possibility of some grave organic central disease, only to be checked by persistent use of suitable measures, should be impressed on the patient's mind.

For many, contagion seems to be the most active cause; that is, in certain surroundings and company they persist in using spirits and drugs, whereas elsewhere the desire passes away. There the same study of causes should suggest a removal of those things which are most active, and a radical change of habits and activities. Innumerable examples illustrate this. A lawyer in active practice drank every night to intoxication. By the advice of the physician he went out into the

country and became a market gardener, where he lived very carefully and fully recovered. Another example was of a man without occupation who drank steadily. By the advice of the physician, he entered into a business that required most exacting care, and became quite abstinent. Another example was of a young man who drank while going through college and afterwards travelled in Europe, drinking more than ever. Later he became a bankrupt, and the drink paroxysm subsided. These are examples of change of surroundings and occupations which, under the direction of the family physician or by change of circumstances, resulted in complete cure.

In another class of patients psychotherapy is a remedy of great value when combined with positive remedial measures. Thus a man lives very irregularly, is a gourmand, is burdened with depressing mental conditions, and takes spirits for relief. If his habits can be corrected and his mental condition changed by psychic suggestions and positive mental influences, permanent cure follows. This is all possible in the early stages, but, after years of continuous exposure to bad influences, a state of chronicity follows, which makes the future uncertain in any sort of treatment. Had these persons gone to the family physician at the beginning, and followed his advice, these conditions would have been avoided. There is another class, called periodic drinkers, in which the personal efforts of the family physician are invaluable. In such cases there are always premonitory symptoms, a knowledge of which would indicate a possibility of breaking up the paroxysm before it explodes. Often thoughtless physicians, in their efforts to help such persons, give morphine or other narcotics, and the patient, finding that these remedies break up the paroxysm, continue their use, and soon become drug-takers.

There is a large class of persons who, when they feel bad, resort to spirits and drugs for their narcotic effects, without any realization of the future danger. Here, again, the family physician can do most effectual work. I give an example. A very strong business man for years had been subject to drink paroxysms of more or less severity, from which he could get no relief. Now by the aid of the family physician, whom he consults the moment he begins to drink, he is able to break up the paroxysmal symptoms by various means suggested. One is to take continuous baths and remain in the water for a long time, followed by the application of saline eliminatives and

rubbing. The other is to go to the woods and take long, exhausting tramps, become thoroughly exhausted, and have an attendant rub him every night after the muscular exertion. A third is to have a restricted diet and take large quantities of extract of quassia and strychnine.

Sometimes occasional cessation from all work, with rest in bed; a change of surroundings and diet, with excessive water drinking, is another method of breaking up the convulsive nerve energies. These are all means which the family physician can determine and put in practice. Later, when the cases become chronic, institutional care furnishes the best means of relief.

In an experience extending over forty years I have noticed that in the last few years an increasing number of inebriates of this class come to institutions for temporary help, where the very same means are used which every family physician should understand and apply. The advantage of an institution is that it makes the application of certain remedies more positive. Such persons are usually conscious of their own weakness and come for the purpose of saving themselves from the dire consequences of prolonged drink paroxysms.

There is no mystery or credulity in work of this kind. The most incurable, both alcoholic and inebriate, can be temporarily restored by the family physician, just in proportion as he understands the conditions he is called to treat. There can be no specific remedies, and no questions of morals, in either of these classes. It is the conditions from which they suffer which can often be treated at home as successfully as in institutions. This the family physician should determine. It often happens that treatment for acute conditions, especially in chronic cases, can be best begun in a sanatorium, but continued under the family physician at home. I have seen many persons who have been most successfully treated, for they have learned at the sanatorium the physical nature of the drink craze, the delusions of the stimulant and tonic value of alcohol, and go back home with a larger conception of their weakness and the need of medical help to overcome it.

The physician who has made a study of the family history can realize how far, and to what extent, remedial measures can be used. If there is a specific history, specific remedies are necessary; if nutrient exhaustion and starvation, that also requires special treatment.

The toxæmias and congestions are well-defined conditions, with measures of relief clearly outlined. Often the physician is discouraged because of the skepticism and egoism of the patient, who insists that he has recovered fully when the craze for spirits has disappeared, and in the period of remorse is willing to do anything, though, when this passes away, he is skeptical to the last degree. Later, the doctor finds an ample field here for the most pronounced psychotherapeutics, coupled with drugs that will break up the mental disorders of the patient.

Thus a patient of this character was made to believe that his egoism and over-confidence in himself were symptomatic of paresis: with this fact on his mind, he followed implicitly the doctor's judgment, and was eventually fully restored. The physician here is called on to reëducate the patient's mind to some extent by making him understand the extreme danger that follows from neglect of the commonest rules of healthy living.

In the alcoholic there are always distinct symptoms of functional and organic change in heart and liver, inflammations of the nerve terminals, and reflex changes, which the physician can clearly show to be connected with alcohol. If the patient cannot be made to understand this, his friends and relatives can, and pressure should be brought to force him to live on a higher plane and follow distinct hygienic rules. If the person is an inebriate, there are often very distinct symptoms of mental failure understood by his friends and often realized in a dim way by the man himself.

There are innumerable examples outside of all institutions where both the friends and the family physician have stupidly neglected the most common-sense means and measures which should have been used. Thus a very able clergyman, after a life of sobriety, suddenly insisted on drinking to intoxication every night. The family and the physician both failed to give the proper relief, but a business man and friend, finding him intoxicated, put him in a hospital and locked him up for two or three weeks. His recovery was marked, and on his return the family physician followed up a distinct course of treatment and he recovered. Here was an example of common-sense in using measures which should have been applied before.

A very eminent politician was found intoxicated at a hotel. His family physician put him in a private sanatorium and insisted that

he was in the gravest condition. He probably gave him the usual eliminatives and tonics with change of diet. The results were most gratifying, for he was an active temperance man the rest of his life.

In certain circles repeated statements are made, with a dogmatism that is startling, of the effect of prayer and conversion in suddenly changing the physical condition and mental derangement. It never occurs to these persons that they are using veritable psychotherapy, which in a certain proportion of cases brings about so-called cures, but that this is only one of the remedies necessary, and, unless applied in connection with others equally powerful, has some dangers attached to it.

The inebriate's condition is often self-limited. Some physiological change may take place in the brain and nervous system and all desire for spirits disappear, though other organic defects remain. The doctor is able to determine this, because he is familiar with the heredity and conditions of living. He knows the peculiarities of the patient, his work and surroundings, and certainly should be the best teacher and give the most practical aid in affections of this kind.

To the army of incurables in this field,—that is, persons who have drunk for many years and have reached a stage that apparently seems to be incurable,—there is still great prospect of health and cure. The State should house a certain number and make them self-supporting in institutions. Private and corporate institutions can give specific, direct medical care and training, very often the most essential requirement, but the family doctor, in both home and consultation treatment, can give temporary aid and personal direction to care and conduct of the most practical character. An example of this will suggest great possibilities. A noted man had drink paroxysms and had been treated by various physicians and in various institutions, and on recovery considered himself well and refused any further treatment. The next paroxysm was very distressing, and it so happened that he called on a physician to help him, expecting to get temporary relief as before, but the latter insisted on making a careful examination, and then announced the possibility of sudden death and the need of a lawyer to draw up a will at once. Then, by shrewd appeals to his desire to live and the necessity of using every possible means for recovery, he secured his confidence and his coöperation in every means of restoration. He was kept in bed for a month, then permitted to go

out, but the physician kept constant watch over him, reminding him of the peril that he was facing. This was kept up for several months with pronounced recovery. Formerly physicians had treated him with morphine, salines, and good counsel, but this doctor realized the need of psychical change, and applied it in the most vigorous way.

All institutions where persons of this class are treated have examples of failures in the general practitioner to give the first aid to these poor, wounded victims who later go on to incurable conditions. There are many reasons for believing such failure in the medical profession to understand alcoholism and inebriety as positive physical diseases, and to give proper treatment both at home and in consultation, results in an army of incurables reflecting badly on the physician's want of knowledge.

Realize that there is always an early stage in inebriety and alcoholism where the possibility of restoration is good, but steadily grows less and less. Unlike the insane or epileptic, there is always a latent hope in the minds of these victims, sometimes very pronounced, that restoration and cure will follow, and a stage in which they will be active to do anything possible: these are the most hopeful signs for medical work.

Of course, there are always inebriates who will not make the least personal effort to help themselves; even in institutions they seem to take pleasure in defeating the purposes of the managers. These are practically in the penumbra stage of insanity, but are hopeful, and oftentimes most marvellous changes occur.

There are always members of families suffering from drink and drug neuroses who look up to the physician for help, and he, of all others, should be their guide and teacher. Physicians should recognize the extreme sensitiveness of these neurotics to narcotics of every description, and the readiness with which they will change from one narcotic to another. Hence the danger in giving drugs of which there are only a few which can be used for temporary effects, and these will occur to the physician as being best adapted for the conditions present. The subsidence of the drink impulse, in both the alcoholic and the inebriate, is very often temporary, and should never be recognized as permanent. A study of other causes and conditions will determine this.

Thoughtful men everywhere recognize that the strains and drains

of modern civilization, with all its bad living, bad thinking, and bad work, are preparing the soil and developing neurotics with drink and drug habits, and this new field of practice is unoccupied to a large extent, except by quacks and irregulars. Let the physician urge the great central fact that these are diseases, that they are contagious and infectious, but curable, and a removal of the causes and change in the conditions of living and thinking afford the best means of escape.

The time is not far distant when the man or woman who drinks spirits regularly or at intervals will be considered sick and needing medical help, for in such there is a process of dissolution going on which will certainly merge into organic diseases and create invalidism for the rest of life.

Consumption and acute pneumonia are all very closely associated and almost certain to follow from any particular exciting causes. Pneumonia is the termination of a very large number, while a species of pneumoparesis, beginning and ending in two or three days, is very common. Cerebral hemorrhage is another condition that is traceable to the use of alcohol, and other diseases and degenerations are almost sure to follow.

The pauper inebriate and the wealthy club man, who drinks at the table and in the club, demonstrate certain well-defined physiological and psychological facts, the interpretation of which opens up a new field for practice, promising the most hopeful possibilities.

DIAGNOSIS AND TREATMENT OF ANTERIO-POLIOMYELITIS IN THE PRE- AND POSTPARALYTIC STAGE

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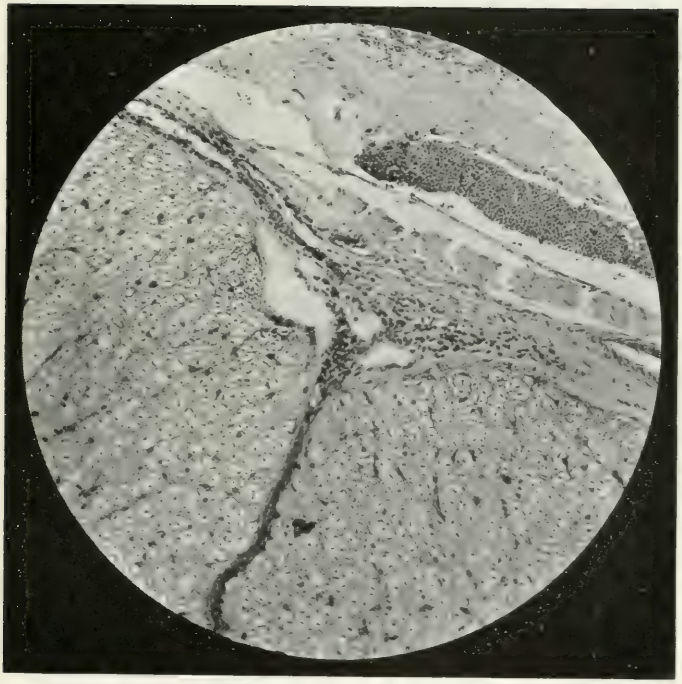
Poliomyelitis is an acute infectious and contagious disease. That it was infectious was pointed out by Struempell in 1884 and by Pierre Marie in 1885, and within the last five years that fact has been definitely established by numerous investigators. While the nature of the virus is not established beyond a doubt, some investigators have isolated and grown a coccus that seems to produce in the monkey lesions similar to those of poliomyelitis. Many important data about its character are available. It is filterable through a porcelain or asbestos filter, it is highly resistant to many destructive measures; thus it withstands glycerinization for long periods and is not injured by 0.5 per cent. phenol. Freezing does not affect it, but it is destroyed in a temperature of 50° C. within half an hour. Weak solutions of peroxide of hydrogen, menthol, and corrosive sublimate readily destroy the virus. I have established that dust carries the virus in a viable state by producing the disease in monkeys from dust of the sick-room of a patient afflicted with poliomyelitis. All investigators concur that the nasopharynx is the point of entry into the system. The disease was produced experimentally by inoculating the nasal discharges into monkeys. This would conclusively prove that it may be disseminated by direct contact or by dust or any article coming in contact with the discharges of the nose and throat. These discharges may be swallowed, and, as it was shown, the virus survives in the intestinal tract; it may, under certain circumstances, contaminate the sick-room through fæces. Rosenau has produced the disease in monkeys by the stable-fly. The manner, however, in which he has produced it, together with the fact that the disease is prevalent in cold climates, and that

we had the greatest and most virulent epidemics in Sweden and Norway, where the fly cannot live, in my opinion decidedly militates against the theory of the propagation of the disease by the fly. Experiments so far show that it is conveyed into the system by the lymphatic system rather than by the blood. So far as the age is concerned, it is preëminently an infantile disease, 85 per cent. of all cases occurring between the ages of one and four years. It rarely attacks an adult. Poliomyelitis, furthermore, shows very definite seasonal variations in its incidence. The records of epidemics in many countries show that it occurs during the summer and reaches its maximum in the late summer and early autumn. From my own clinical observations in a large number of cases, and the fact that epidemics recur every three or five years in the same locality, and the fact that it is rather uncommon for more than one child in the same family to be afflicted at the same time, I have come to the conclusion that there is a neuropathic constitution as a predisposing factor of the disease. The question of an active immunity, however, should not be overlooked.

Before entering upon the discussion of the clinical picture I deem it necessary to review the pathology of the disease as we understand it to-day. This, like the symptomatology, we must divide into two stages—the pre- and postparalytic. In this connection it is well to bear in mind that poliomyelitis is no more regarded as a disease affecting the anterior horns of the cord alone, but rather affecting the entire cerebrospinal axis, the white matter and the meninges as well. Nor are the other viscera to be disregarded, for in no small number of cases these are also affected; so that in recognizing that acute poliomyelitis is a general infection it may easier be explained as to its course and the bearing it has on its treatment. The lesions in the experimental as well as in clinical cases are alike, and in both instances they vary in intensity.

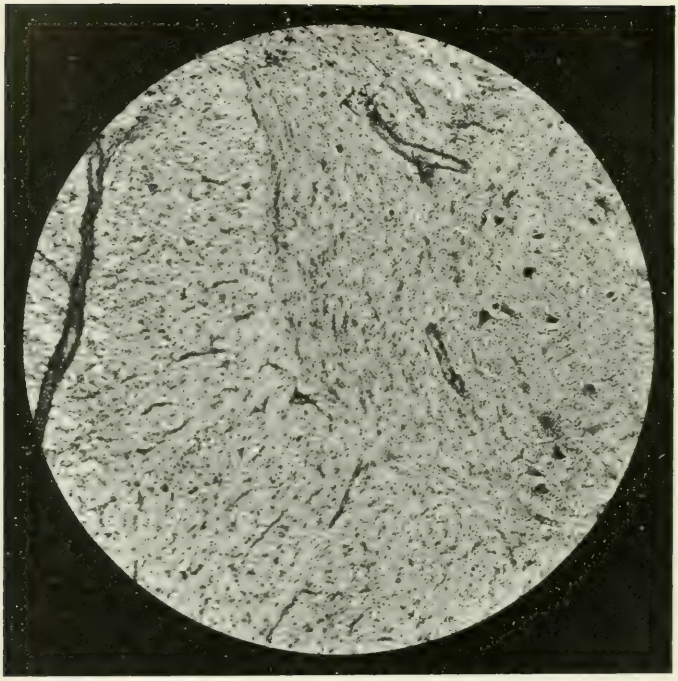
In the prodromal stage we find a hyperæmia of the cord and the meninges; the vessels of the brain cortex, basal ganglia, ventricles, pons, bulb, and cord at all levels, especially marked in the lumbar and cervical regions, are congested. The entire cerebrospinal axis presents an œdematous condition. Yet there is little, if any, increase in the cerebrospinal fluid. This is clear, as a rule, in this stage, and contains a large amount of mononuclear cells—lymphocytes exclusively. The cell count may range anywhere from 30 to 900 cells per cubic

FIG. 1.



Section of cervical cord of a monkey, showing a perivascular round-cell infiltration in the pia of the anterior fissure. (Spencer 16 Mm., × 75.)

FIG. 2.



Section of cervical cord of monkey, showing a round-cell infiltration in the pia of the anterior longitudinal fissure, perivascular infiltration in anterior horn, also scattered foci of infiltration in the gray matter of the anterior horn. Ganglion-cells show beginning degeneration. (Spencer lens, × 100.)

millimetre; its globulin content is increased, and its reducing property of Fehling's solution, due to the presence of dextrose, is intense. The brain and cord, on section, have a moist, translucent, œdematous appearance, and the gray matter of the cord is often swollen so that it projects above the level of the white matter. Frequently punctate hemorrhages can be discerned by the naked eye. Bearing in mind that the point of entry is accepted to be the nasopharynx, we ought to find some evidence of this focus. Nearly all investigators have called attention to the fact that there is no redness of the throat in the ordinary acceptance of the term in throat affections. On the contrary, they all report the throat as negative. To my mind the throat is not negative at all. The paleness of the nasopharyngeal mucosa, its œdema, and, in the early stage, accompanied by a serous, frothy transudate, is a constant accompaniment of the affection and pathognomonic of the earliest prodromal stage. This is analogous to the œdema of the cord and brain. I know of no affection in which such a condition of the pharynx obtains. Since the infant swallows the nasal discharges and some may also enter the bronchi, we can explain at times the presence of foci of congestion in the lungs and alimentary tract. The virus, as has been established, is propagated by the lymphatic system, and we may, therefore, have foci of congestion and œdema in various glands.

Histologically the disease is characterized by a perivascular and interstitial infiltration of round mononuclear, polymorphonuclear, and endothelial cells (Figs. 1, 2, 3, 4, and 5). This is also true of the lymph-spaces around the ganglion-cells of the anterior horns in the cord (Fig. 6), the cells of the nuclei of the cranial nerves and in the cortex, basal ganglia, and cerebellum. The vessels of the pia in the anterior longitudinal fissure of the cord and the pericellular lymph-spaces of the posterior spinal ganglia are the very first to be involved (Figs. 1 and 7). This has been experimentally demonstrated as early as the third day after infection. This infiltration follows along the sheaths of the central vessels of the cord into the anterior horns (Figs. 2 and 4). Not infrequently do we find an involvement of the vessels of the white matter of the cord giving us a picture of transverse myelitis. In such cases the infiltration may be focal or diffuse throughout. The capillaries of the gray matter of the cord are engorged. The degenerative changes in the ganglion-cells in this stage are not marked,

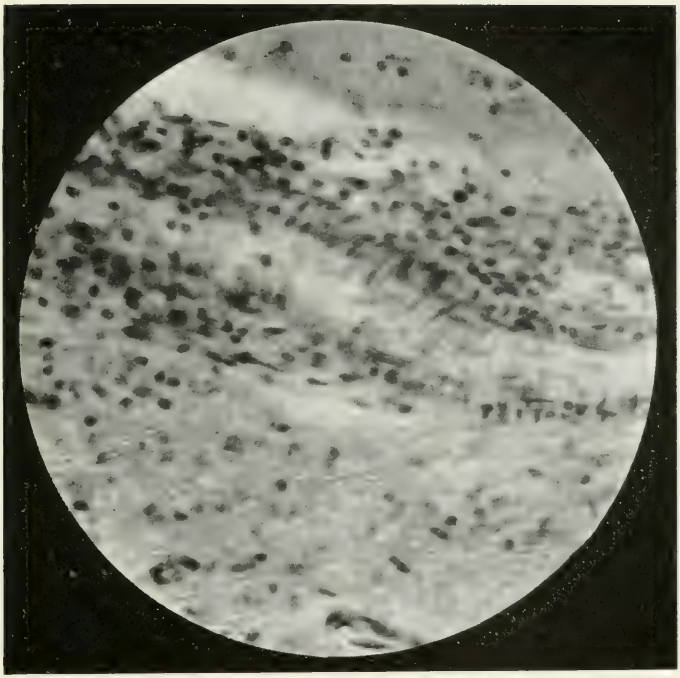
but there is a marked gliosis (Fig. 2). The first changes then are those of an acute interstitial meningitis, which is not associated with fibrin formation or with an exudate on the surface of the meninges. To summarize, the whole process is one of an inflammation. The blood presents quite early a leucocytosis with a predominance of mononuclears (Fig. 3).

If the process goes on to the subacute or chronic stage, we find following changes in addition to those enumerated. The pericellular exudate forms a sheath apparently completely surrounding the vessels for long stretches, pressing on the lumen of the vessel, and thus exerting a mechanical obstruction of circulation (Fig. 4). To this mechanical obstruction I ascribe the œdema and one phase of cell degeneration. Devoid of nutrition, the cell swells up, the Nissl bodies coalesce, the nucleus becomes eccentric, and the cell finally breaks down, becoming autolyzed in its own ferment, there being no antiferment present to counterbalance it. There is also another phase of cell destruction. Flexner and Noguchi have been able to stain the germ on thin film preparations of the cord, and the fact that we invariably have a tremendous pericellular infiltration of leucocytes would point to a cell destruction by the germ itself, the process being that of a neurone phagocytosis. In these instances we note a progressive cell vacuolization rather than an autolysis. Once the cell is destroyed it is conceivable that later we should find a degeneration of its axon. As this process is becoming complete the whole anterior horn structure is converted into connective tissue; it shrinks and presents what older writers found as scars (Fig. 8).

The ganglion-cells of the gray matter of the spinal cord possess somatic functions, and, once destroyed, must of necessity produce trophic disturbances in muscles and bones supplied by their axons; and the very first to atrophy is the affected muscle. In later stages we find also involvement of bones (Fig. 9).

A word about the question of immunity and the nature of the toxin of the virus. Various observers have found that the serum of a patient or animal recovered from the disease will neutralize the virus *in vitro* after an incubation period of an hour in a temperature of 37° C. Such mixture injected into a monkey will not produce the disease; nor will an animal again be successfully infected after it once recovered from the affection. Animals were also rendered actively

FIG. 3.



Vessel in anterior horn of human cord, showing perivascular and interstitial infiltration of mononuclears and polymorphonuclears. (Powell and Leland lens, × 300.)

Fig. 4.

Section of human cord lumbar segment, showing perivascular round-cell infiltration in the anterior horn, the ganglion-cells being gone. (Spencer lens, × 300.)

immune by successive vaccinations with the attenuated virus after the method of Pasteur. On the other hand, it was established that the serum of a recovered case had no protective or curative power whatever. As to the character of the toxin, we have so far established that, whatever exotoxin there may be, it is a negligible quantity and of no great toxicity. Nor is the endotoxin very toxic. This conclusion I have reached from my experiments and clinical data at hand. After three years of research I succeeded in separating the endotoxin and found that the product of a suspension of a virulent virus, of which 0.1 Cc. did bring a monkey down in six days, would kill a rabbit of 900 Gms. only when injected with 15 Cc. Guinea-pigs immunized with such endotoxin have yielded a serum which rendered the virus *in vitro* inactive after an incubation period of three-quarters of an hour in a temperature of 37° C. Whether such serum possesses any protective or curative power remains to be seen at the conclusion of my work.

SYMPTOMATOLOGY

Our difficulty lies mainly in the possibility of early diagnosticating the disease before the onset of the paralysis. The importance of this cannot be overestimated, since it may afford us a means of attempting to intercede in time to prevent a paralysis and, possibly, death. With all the enumeration of symptoms in various stages of the disease, with the proverbial " It may be this or that " and the " ifs and buts " accompanying them, we are positive of our diagnosis only when the paralysis appears, when, as a rule, it is too late to be of practical service. Many a physician will remember how his prestige suffered because he did not make the diagnosis early, and the consultant was fortunate enough to arrive just when a partial or complete paralysis appeared, while just one hour before on his visit there was no discoverable paralysis or even weakness in the affected limb. In clinical as well as in experimental cases we meet exactly with this condition. The paralysis comes at once, like a thunderbolt from a clear sky, after the fever has disappeared and a recovery of the patient is looked for; in other words, when it is least expected.

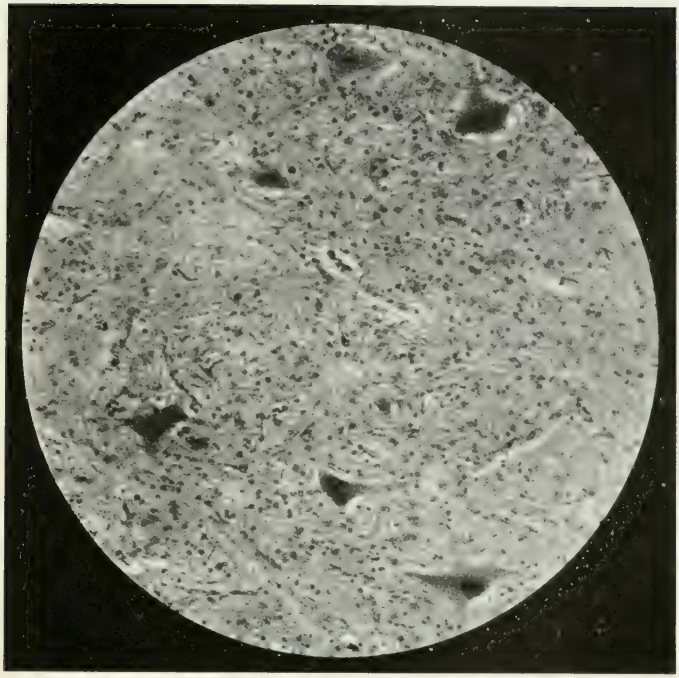
While the cytological findings of the cerebrospinal fluid, when positive, are a criterion for the disease quite early, before the paralysis sets in, a lumbar puncture cannot be resorted to in every case, espe-

cially in those where the onset is mild or obscured by gastro-intestinal symptoms that are, as a rule, interpreted as cholera infantum by physician and parents.

In searching, then, for a set of symptoms during the preparalytic stage that would prove a criterion of this disease, we must have recourse to its pathology in that stage. Bearing then in mind the picture described above, we may expect *fever* quite early as the very first sign, accompanied sometimes with vomiting, with or without diarrhœa. Alongside of this there are present nasopharyngeal symptoms without exception. Frequently we hear that the patient began to sneeze, or made attempts at sneezing, and it was thought to be a case of measles. Upon inspection, however, as investigators always point out, there is not that red, sore, and hyperæmic throat, but a rather anæmic, glistening, œdematous condition of the nasopharyngeal mucosa, with a serous, frothy transudate, quite analogous to the œdematous swelling of the cord that we see upon autopsy. This condition I have noticed to persist in the majority of cases even some weeks after the onset of paralysis. Many laryngologists have assured me that they have not met with a similar condition in any disease. I desire to lay stress upon this sign, as, in my opinion, pathognomonic of the disease at its onset, and, taking it in conjunction with other signs that I am about to enumerate, will put the general practitioner, who is the first one to be consulted, in a position to diagnosticate the case quite early. With this sign present, it becomes imperative to make a lumbar puncture, and the above-enumerated cytological findings will at once clear up any doubt.

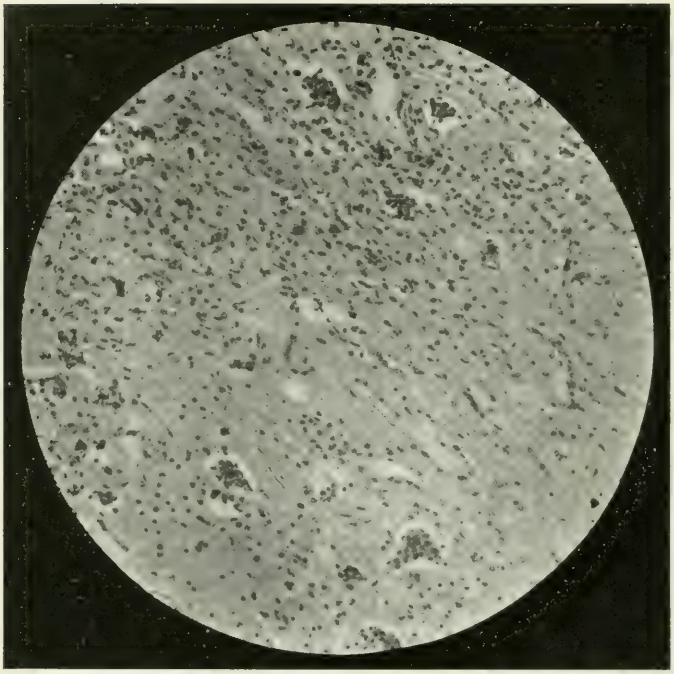
Headache and *pain* ought to be, and as a rule are, constant accompaniments. The little infant cannot tell us of its headache, but he is giddy and drowsy, but never comatose, the intellect is always clear, and the child is easily roused. This would bear out my statement above, that the exotoxin is of a negligible quantity and the endotoxin is not very actively toxic, or else there ought to be very high fever and delirium or even coma. The older children, when affected, always complain of this characteristic headache and giddiness. These symptoms are due rather to the hyperæmia of the brain vessels and the œdema without any appreciable augmentation of the cerebrospinal fluid. In my clinical and experimental cases I have not met with any increase in the amount of cerebrospinal fluid.

Fig. 5.



Section of human cord, showing focal round-cell infiltration and partial degeneration of ganglion-cells in the anterior horn. (Spencer lens, × 300.)

FIG. 6.



Lumbar section of cord of monkey, showing a diffuse infiltration in anterior horn, and ganglion-cells being destroyed in the process of neuronophagocytosis. (Spencer lens, × 150.)

It has been shown that in experimental as well as in clinical cases the exudate in the intervertebral ganglia (Fig. 7) is quite marked early in the disease, and associated with this infiltration there is an inflammation of the meninges of the cord in the lumbar and frequently also in the cervical region. For these reasons there is, quite early, pain in the extremities and along the spinal column, a hyperæsthesia along the affected area, and rigidity of the muscles of the neck. It should be remembered, however, that there is no pain on pressure along the course of the peripheral nerves of extremities, but rather on extending the affected limb. The children are found with their extremities in a flexed position, and an attempt to extend them, or even a slight passive motion, produces excruciating pain—so much so, that the patient cries when only approached by the physician or nurse, as he is apprehensive. The pathological condition, when extending to the brain meninges, may give rise to simple twitchings or even convulsions in direct proportion to the extent and intensity of the affection. The patients, as a rule, favor some extremity in particular, for there is the weak spot, and this favored extremity will become paralyzed. Reflexes may be absent.

To recapitulate, then, we meet in the prodromal stage with the following constant symptoms: Sudden onset with fever, headache, drowsiness, at times twitchings or convulsions, pain in extremities on passive motion and along the spinal column on pressure, sometimes gastro-intestinal disturbances, the above-mentioned nose and throat symptoms, and the cytological findings of the cerebrospinal fluid. Some investigators call attention to a profuse perspiration quite early. I cannot verify it.

In attempting to classify the symptom-complexes of the subacute and chronic stages we must bear in mind that in reality we are dealing not with an anterior poliomyelitis but with a polio-encephalomeningomyelitis. In these stages we get the end results of the infection; the symptoms indicating the site or sites of involvement anywhere along the cerebrospinal axis. In these stages some of the prodromal symptoms disappear, notably fever, headache, and the gastro-intestinal symptoms, if such were present, and often also pain. In these stages all symptoms may clear up and the case may be one called abortive, of which there are a great number reported. Then again are the several groups of paralyses depending entirely upon the focus of infection,

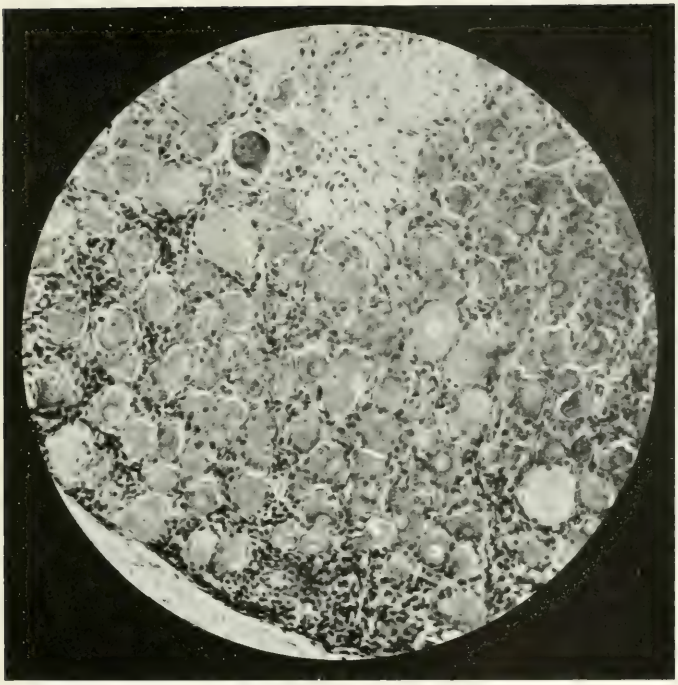
such as (1) cerebral, (2) bulbar, (3) spinal, (4) pontine and cerebellar, and (5) mixed types. The cerebral type is rare, and it is perfectly clear that if the sensorimotor region is involved we will get a spastic hemiplegia, with or without epileptiform seizures, or, if only the centre of one extremity be involved, a spastic monoplegia will result. The bulbar type represents an involvement of the nuclei of the cranial nerves, and the result will be a paralysis of the group of muscles supplied by the particular nerve. The facial is the most common to be involved, resulting in a complete Bell's palsy. In the spinal type we have, of course, the flaccid paralysis of one or more extremities, according to which segments are involved. Here the motor neuron emanating from the anterior horn cell becomes destroyed, there is a break in the spinal reflex arc, and a flaccid paralysis, with complete loss of reflex, wasting, and loss of response to the faradic current and reaction of degeneration, must result. In the course of time this condition results in contractures, shortening of the affected limb, and all forms of orthopædic defects. The pontine and cerebellar types give us ataxia and tremors. The mixed types are those of bulbospinal or cerebrospinal symptom-complexes. It seems to me that such classification reconciles the chief clinical symptoms with the predominant anatomical lesions.

TREATMENT

From the foregoing statements it can readily be seen that prophylactic measures are essential. The disease is directly contagious and is disseminated by healthy as well as by sick carriers. To protect the public health a strict quarantine should be established. Since I have shown that dust contains the virus in a viable condition I advise a thorough scrubbing of the floors with an antiseptic solution and frequent flushing of the streets. These measures have given satisfactory results in the checking of the spread of the disease. The nasopharynx of every healthy individual in the family should be sprayed with a 0.5 per cent. menthol albolene twice daily for a period of two weeks. Bedpans and urinals should be washed with an antiseptic solution, and bed-clothes thoroughly boiled.

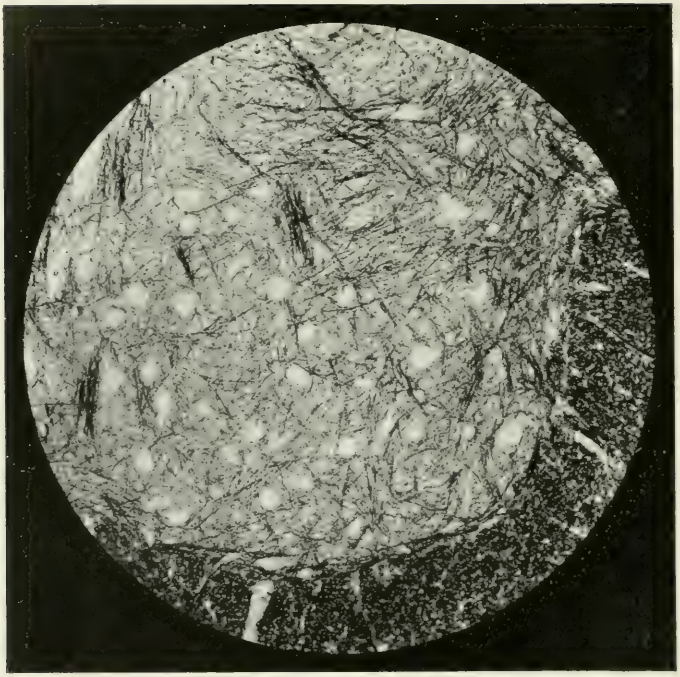
The treatment during the febrile stage demands, above all, complete mental and physical rest, and should be continued even for two weeks after the fever disappeared and paralysis set in. We must

FIG. 7.



Shows a diffuse round-cell infiltration in the pericellular lymph-spaces of an intervertebral ganglion of a monkey. (Spencer lens, × 150.)

FIG. 8.



Weigert-Pal stain of human cord; anterior horn, showing complete disappearance of ganglion-cells and all structure converted into connective tissue. (Spencer lens, × 75.)

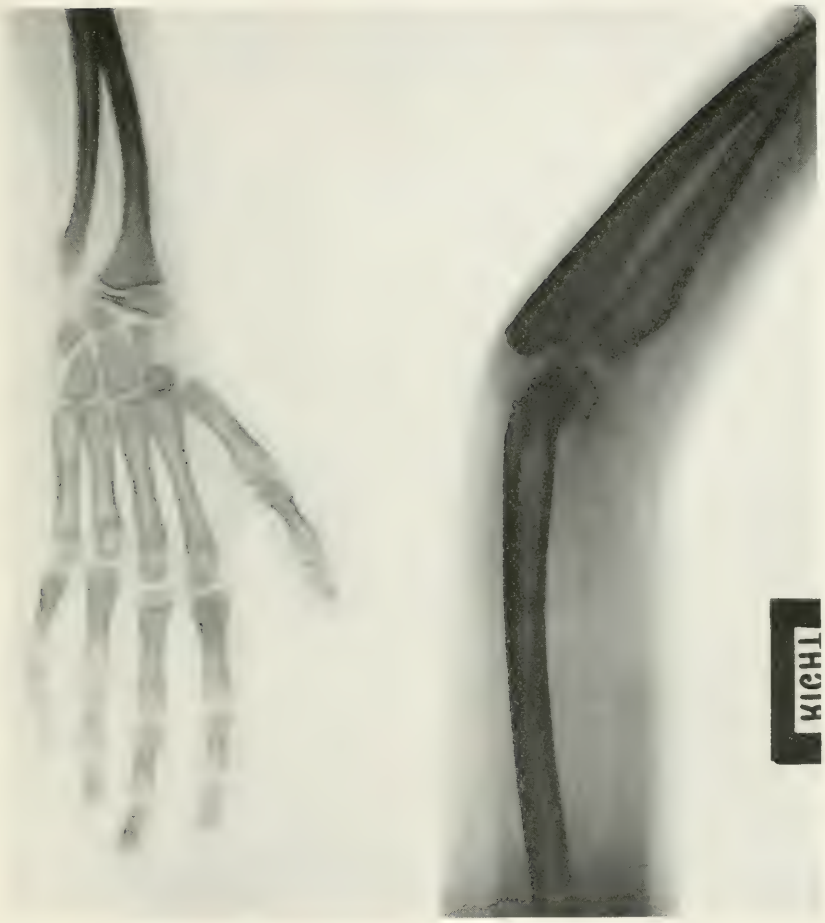
bear in mind that pain is a prominent symptom in the acute stage, and every movement causes discomfort and pain. The patient, therefore, must be moved with extreme gentleness; one should avoid flexing the neck or hips, or extending the limbs, or even bending the spine. I should even forego sponging in high fever in order not to cause pain by such manipulation. Bromides are, as a rule, efficient in alleviating pain in infants, but in older children opiates with some coal-tar preparations are of value. An exclusively fluid diet and catharsis, when necessary, go without saying. The nasopharynx should be sprayed with a 1 per cent. solution of hydrogen peroxide every two hours and afterward rinsed with a normal salt solution. A cold compress to the head in cases of fever above 102° F. is soothing. When the acute symptoms pass we must institute a more active treatment in order to prevent possible deformities and restore such muscular function as the condition may warrant. My only guide as to the time when such treatment should begin is when pain completely subsides, and not earlier. So long as pain lasts, even with the fever gone, I immobilize the affected limb by putting it in a well-padded splint, and patients are invariably grateful. During the stage of active exudate manipulation of the extremity will cause fatigue in the nerve-cells and enhance the process of deterioration, while rest may, and frequently does, hasten absorption of the exudate, and a restitution of function in nerve-cells and muscle is possible. All our spontaneous recoveries are due, in a great measure, to such precautions. Warm baths during the afebrile stage are of great benefit, and the patient should be left in the bath so long as he can comfortably remain—the longer the better. With the pain gone, and a fortnight after the onset of the paralysis, we may begin with massage, passive movements, and galvanism. No more than five minutes should be allotted to these measures daily. In using galvanism I prefer the interrupted rather than the continuous current.

Active exercise of the muscles by the patient should be encouraged. And this is best accomplished with infants while bathing daily by putting into the tub some floating toys and encouraging the infant to attempt to handle the object with the affected limb. Older children can be persuaded to counteract antagonistic passive movements by the masseur. We must remember that at times many cells in a given involved segment may escape destruction and some groups of fibres

will be restored in their function if thus encouraged. In this treatment one should persist for years. To avoid contractures, counteracting splints may be applied with profit, but left on only part of the time at the beginning, say only over daytime, and removed at night. If no improvement is noticeable in any muscle group after persistent treatment for six months, it is advisable to resort to orthopædic measures or tendon transplantations or other surgical means, as there may be an indication. That the patient should at all times have a bland, well-nourishing food and fresh air, applies here as well as in all febrile and wasting diseases.

Let us hope that the day is near when the longed-for specific will be discovered and patients saved from physical infirmities that incapacitate them for life, or perhaps from death itself. Until then I plead that we should *do* all we can, but in our zeal take care not to *overdo.*

Fig. 9.



Radiograph of an old neglected case of wasted and distorted arm; the radius and ulna being twisted over one another, the humerus curved upon itself, and defective ossification in bones of hand.

UNUSUAL FORMS OF POLIOMYELITIS

BY JAMES HENDRIE LLOYD, M.D.
Philadelphia

As is well known, poliomyelitis has prevailed in epidemic form in recent years in various parts of the world. These epidemics have served to show that, from the clinical standpoint, we must modify or enlarge our view of the symptomatology of the disease. Formerly it was customary to regard poliomyelitis as a rather distinct entity, with a rather limited range of symptoms. For instance, we knew that it began as an acute affection, with febrile reaction, occasionally with a convulsion, with rapid onset of paralysis, usually in one limb, which paralysis gradually receded until it remained localized and permanent in a few muscles or a group of muscles. This was the disease which we called infantile paralysis, from the fact that it usually occurred in young children. Our conception of the disease, as thus outlined, was based largely upon sporadic cases.

In the epidemics, however, it has been observed that not a few cases occur which do not present this classical type. In these cases the symptoms have a much wider range, and in some of them not only the spinal cord, but also the bulb, the pons, the mid-brain, and even the cerebrum are involved. This has led to the differentiation of several unusual types of poliomyelitis. It is probable, however, that such unusual types are not confined to the epidemic form of the disease, but that with more exact and enlightened observation it will be found that they also occur as sporadic cases. At least this has been the writer's observation.

In Philadelphia we have hardly had epidemic poliomyelitis, at least not to the extent that it prevailed a few years ago in New York City; nevertheless, the disease has been more prevalent here than usual, and some observers have noted distinct varieties of it.

Wickman, of Stockholm, whose studies of epidemic poliomyelitis have been at first hand, has emphasized the fact that varieties occur,

and has suggested a classification.[1] According to this Swedish observer, the following types may be distinguished: (1) The spinal poliomyelitic form; (2) the form resembling Landry's paralysis; (3) the bulbar or pontine; (4) the encephalitic; (5) the ataxic; (6) the polyneuritic (resembling neuritis); (7) the meningitic; (8) the abortive.

Other observers, as Zappert and Krause, propose somewhat similar groups. From my own observation I believe that these classes do not include all possible varieties, for, as I hope to show, there is still another variety, which may be called the transverse myelitic type.

As this paper is largely clinical, I shall not take up time and space to discuss the important work of Flexner and others on the pathogenesis of this disease. It is enough to say, in passing, that it would be strange indeed, in the case of such an infectious disease as poliomyelitis is now proved to be, if it were not found that its ravages in the nervous system were more extensive than we formerly supposed.

For instance, Harbitz and Scheel found that the brain and bulb were often involved in the epidemics in Norway.

Not a few observers have pointed out the resemblance of poliomyelitis to epidemic cerebrospinal meningitis.[2] In fact, the distinction is sometimes difficult to make. In the New York epidemic, we are told, meningeal involvement was frequent, particularly in the early stages, so that the differential diagnosis between meningitis and poliomyelitis was not easily made.[3] I have had this same difficulty in cases in this city. The extreme meningeal irritation, as shown by rigidity of the spine, rhachialgia, and shooting pains in the limbs, with fever and delirium, causes these cases, for the first few days, to resemble closely cases of cerebrospinal fever. In the Swedish epidemic, Wickman observed transitions from distinct meningitis to typical poliomyelitis. All the symptoms of an acute meningitis in all degrees and in all possible combinations were a part of the picture of the disease. Spieler, in the epidemic in Vienna, saw cases that so resembled tubercular meningitis that it was not until some time had elapsed that their relation to poliomyelitis was suspected. Even the prodromal

[1] "Beitrage zur Kentniss der Heine-Medinschen Krankheit"; also "Acute Poliomyelitis," translated by Maloney, New York, 1913, p. 38.

[2] Wickman, *Op. cit.*, p. 77.

[3] Report of the Collective Investigation Committee, p. 53.

symptoms of a basal meningitis were present. Netter also saw these meningeal forms in Paris. They serve, according to Wickman, to explain the confusion in the minds of some observers who have claimed that epidemic cerebrospinal meningitis and epidemic poliomyelitis may occur side by side. What such observers have really seen has been the meningeal type of poliomyelitis.

The polioencephalitis of Strümpell has been relegated by some writers to poliomyelitis. In this disease the brain cortex, especially in the motor region, has been claimed to be involved. The disease has the characteristics of a cerebral palsy of childhood. There is an acute onset, with an initial stage of fever, vomiting and convulsions, followed by paralysis, which may be a monoplegia, a hemiplegia, or a facial paralysis. Wickman holds that this polioencephalitis must be deemed a special form of cerebral infantile paralysis (*i.e.,* due to the poison of poliomyelitis), and he argues the question at length, basing his argument on both pathological and clinical grounds, and a review of the literature. In one case an acute encephalitis of the left optic thalamus was found. It is especially to be noted that the paralysis in these cases is *spastic,* in marked contrast with the usual type of paralysis in the spinal forms. Bucelli found synchronous cases of encephalitis and poliomyelitis in a small epidemic in Genoa. On the other hand, in the New York epidemic the committee failed to find evidence of Strümpell's polioencephalitis. I shall report briefly in this paper a case in which an encephalitic type followed closely on a spinal type in a child.

Landry's paralysis has been a much-mooted disease. It is characterized usually by a rapidly-ascending paralysis of the flaccid spinal type, often involving the bulb, and ending not uncommonly in death. Some observers, including Wickman, have seen in this disease a form of poliomyelitis. Gordinier, in a recent paper,[4] thinks this opinion too sweeping; and he attempts to distinguish between Landry's disease and acute poliomyelitis. He holds that the prodromal stage is different and less marked in Landry's disease, and that paralytic residua are more marked in poliomyelitis. In the latter disease there is a more marked infiltration of small mononuclear round cells in the perivascular spaces. But it seems to me that such differences may

[4] *Journal of Nerv. and Ment. Dis.,* Oct., 1914, p. 640.

simply be due to variations in the intensity of the infection and in the resistance of the organism, and cannot serve as a basis for dogmatic differentiation. What is of more interest, perhaps, is to associate with these rapid, widespread infections the form of poliomyelitis which is called the polyneuritic type. Some cases closely resemble multiple neuritis. There is, however, a very acute onset, with fever, meningeal irritation, as shown by rhachialgia, stiffness of the spine, pains in the limbs, and Kernig's sign, and a resultant widespread flaccid paralysis, involving even all four limbs. To what extent the nerve trunks are involved is still a question; but, even though these cases should prove to be largely spinal, their close resemblance to polyneuritis justifies calling them by the name which indicates the resemblance, even if it does not connote an identity.

My object in this paper is to discuss and illustrate especially the polyneuritic form, the encephalitic form, and a form which I prefer to call the transverse myelitic form. The latter form, so far as I know, has received little, if any, attention from writers on either sporadic or epidemic poliomyelitis.

THE POLYNEURITIC TYPE

During this past summer I had under my care in the Methodist Episcopal Hospital at the same time two boys who had strikingly similar forms of paralysis, of very acute onset, with febrile symptoms. In both cases the paralysis closely resembled that of multiple neuritis, but the history in neither case showed any exposure to a poison, such as alcohol, diphtheria, or lead, capable of causing this form of paralysis. At the onset the meningeal irritation was so great that a suspicion was aroused that the cases might be instances of cerebrospinal meningitis, and the patients were for a while isolated and the Bureau of Health notified. During the summer, however, there had been little, if any, meningitis in Philadelphia, and the subsequent history showed that the cases were not cerebrospinal fever. The patients were not related and were not near neighbors, although they both came from the southern part of the city.

R. C., white, male, aged 15 years. On a very hot Sunday in August he went rowing and bathed in the river. That evening he felt ill, with severe headache and fever. On Monday he worked, but continued to feel ill. On Tuesday he started to work, but had to be

helped home, feeling weakness in his legs for the first time. When admitted to the hospital on August 16 he was running a high fever. His temperature on the 17th went up to nearly 106°; then it ran down rapidly, until on the 18th it reached 101°; then it ran along for several days at about 100° to 101°. After that it became practically normal. The Widal reaction was negative; there were no rose spots or distinctive symptoms of typhoid fever. It is to be noted, however, that this boy's brother was in the hospital at the same time suffering with typhoid fever, from which he eventually recovered without paralytic symptoms.

The patient was delirious for a few days. When admitted he had a flaccid paralysis of his legs, but it was not until he came out of the delirium that it was seen that his arms also were paralyzed. He himself did not know of the paralysis of his arms until this time, although he recollected that his legs were paralyzed early in the attack. Hence it is to be noted that the paralysis was of the *ascending* type. There were no bulbar symptoms or involvement of any cranial nerves. The eye-grounds were normal. The paralysis was flaccid with abolished deep reflexes.

The laboratory reports were as follows:

August 18.—Leucocyte count, 19,150. Widal reaction negative. Cerebrospinal fluid clear. Noguchi reaction positive, moderately strong. Nonne reaction negative. Total cell count, 4 cells to 1 cmm.; no tubercle bacilli.

August 20.—Wassermann test on spinal fluid negative.

August 22.—Cerebrospinal fluid clear. Noguchi weakly positive. Nonne negative. Cell count, 3 to 1 cmm.; no tubercle bacilli.

At the present writing (October) this boy is able to go about, but both arms are still very weak and he is partially paralyzed in his left leg. The left arm is the worse, and presents an upper-arm type of paralysis, with marked atrophy of the shoulder muscles. He cannot lift this arm at the shoulder. He thinks he had diplopia while in the hospital, but there is none now. No cranial nerves involved. No anæsthesia; no bladder weakness. The left leg is weak; the knee-jerk is *free,* but there is no ankle clonus or Babinski reflex.

The second case was very similar to the first, except that the meningeal symptoms were more marked.

W. M., white, male, aged 16 years. Admitted to the hospital, August 29. One week previously the patient first complained of severe headache and general malaise. The next day he was unable to walk, and had been confined to bed ever since. He had been feverish, with severe pain in his back and limbs.

On admission this boy was paralyzed in all four limbs. The paralysis was flaccid, with abolished deep reflexes. There was no anæsthesia; no cranial nerve involvement; no delirium; no bladder weakness. The pain in the back and limbs was extreme, causing the patient to cry out constantly. The back of the neck was rigid, as were also the arms and especially the legs, and he screamed with pain if the legs were moved passively. Kernig's sign was well marked. The pain, however, was not in the muscular masses on pressure, as is seen in multiple neuritis. It was the typical pain, with rigidity, seen in spinal meningitis. The legs were more paralyzed than the arms. There was no fibrillation, but the muscles became moderately atrophied.

The laboratory reports, summarized, were as follows:

The Wassermann test on the spinal fluid was negative. No organisms were found at first in the fluid, which was perfectly clear and faintly alkaline. Fehling's solution was slightly reduced. The Nonne test was negative; the Noguchi test positive and moderately strong. The total cell count, 56 cells to 1 cmm.; small leucocytes, 95 per cent.; large leucocytes, 2 per cent.; polymorphonuclears, 1 per cent.; endothelial, 2 per cent. Gram stained slide—no organisms. Tubercle bacilli negative. The Widal reaction negative.

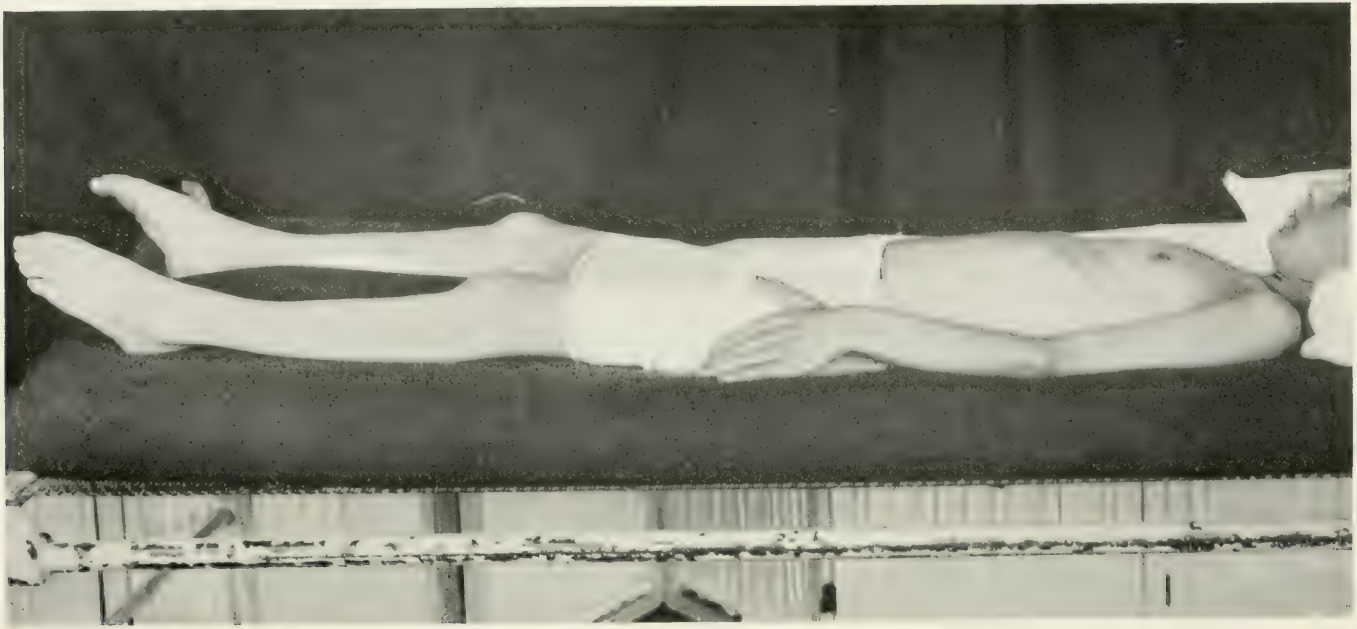
September 1.—Cultures inoculated on human blood agar. Later these cultures presented no pathogenic organisms.

September 4.—Cultures again made on human blood agar. Later these cultures showed: (1) Large Gram-positive cocci; (2) large Gram-negative cocci; (3) small Gram-negative cocci occurring in pairs and singly. Morphologically they resembled to some extent the meningococcus.

September 6.—Another culture, which later showed these cocci had disappeared. N.B.—The spinal fluid was contaminated when it reached the laboratory. Probably all the organisms found were the results of contamination. At the same time there was a resemblance of the cocci to the *Diplococcus intracellularis meningitidis.*

The clinical course of the case, however, was against the diagnosis of cerebrospinal meningitis. The acute spinal symptoms, with fever, rapidly subsided under repeated doses of Dover's powder, and in a few days the boy was free from pain, but with a resulting widespread

Fig. 1.



Polyneuritic form of poliomyelitis.

paralysis of the arms and legs. This is not the clinical history of cerebrospinal fever.

The form of this paralysis is well seen in the photograph (Fig. 1). The legs are more paralyzed than the arms, and the left arm more than the right. The resemblance to multiple neuritis is to be noted, especially in the paralysis of the extensors, as seen in the wrist-drop and foot-drop. The muscles of the legs are much atrophied, as are also the intrinsic muscles of the hands, especially the right, which is not shown in the photograph. Against the diagnosis of multiple neuritis, however, were the acute onset with fever and meningeal rigidity and pain, the rapid subsidence of these initial symptoms, leaving a widespread flaccid paralysis, and the absence of exposure to alcohol, lead, or diphtheria. The onset and course of the disease were more suggestive of poliomyelitis. The cultures made in the laboratory do not seem to have been decisive; they leave unsettled the nature of the organisms found.

The cell count in the cerebrospinal fluid was low in both of these cases, especially the first. This is against the diagnosis of cerebrospinal fever. According to Wickman, the cerebrospinal fluid was always found clear in his cases of poliomyelitis. This was noticeably so in my first case. In the second case the number of cells was rather large for poliomyelitis.

THE TRANSVERSE MYELITIC TYPE

A total transverse lesion of the cord in poliomyelitis must be a rare affection, as there appears to be little, if any, mention of such a lesion in the literature. Wickman, indeed, speaks of a possible involvement of the pyramidal tract in a case in which the arm of one side presented a flaccid paralysis and the legs showed an increase of the reflexes. Evidently, he thinks, the pyramidal tract in its course through the segments of the affected cervical cord was injured.[5] In a few cases the bladder has been reported weak.

There is no apparent reason why the infection of poliomyelitis may not occasionally cause a partial, or even a total, transverse lesion of the cord. It is capable, apparently, of causing extensive lesions

[5] *Op. cit.*, p. 48.

in the brain, in which both white and gray matter are involved. Thus Wickman speaks of the temporal lobe and the optic thalamus being the seats of rather extensive lesions. What occurs thus in the brain might be supposed capable of occurring in the cord. My observation of such a possible lesion is based on only one case, but this case was so noteworthy, both in the cord symptoms and also in a secondary attack involving the brain, that I present a brief report of it. If it was not an example of poliomyelitis, it is difficult to see just what it was. The case was anomalous, to say the least. It occurred in the practice of Dr. John W. Eckfeldt, to whom I owed the opportunity to see it.

Dorothy C., aged 10 years, was a healthy and well-developed child. On March 10, 1914, she was taken with pain in her back and legs, and her mother noticed that she was weak in her legs and tended to fall upon her knees. On her attempting to rise the next morning the pain was severe in the small of the back. The child vomited, and apparently was feverish. The weakness in both legs had increased, so that she was almost paraplegic. There was also loss of control of the bladder and bowel.

On this patient's admission to the hospital a few days later there was complete paraplegia. The paralysis was not flaccid, and there never was atrophy. The knee-jerks were increased, and there was lively ankle clonus and a Babinski reflex on both sides. There was also tactile anæsthesia from the mid-dorsal region down; also weakness of the bladder and sphincter ani. The arms and cranial nerves were not affected. The patient's temperature ran a slightly febrile course for a few days. The cerebrospinal fluid was clear, 3 cells per cubic millimetre. Nonne and Noguchi reactions negative.

An X-ray picture failed to show any lesion of the vertebræ. There was no external sign of Pott's disease. The laboratory reports do not mention the Wassermann test, but my recollection is that it was taken and was negative.

The appearance of the case at this time was grave, as there was every indication of a severe transverse lesion of the spinal cord. The diagnosis seemed uncertain, but in view of the extremely acute onset, with symptoms of an acute infection, I believed it to be a case of poliomyelitis.

The subsequent history was even more remarkable. In the course

of a few weeks the child made a good recovery, much to my surprise. The paralysis entirely disappeared, leaving no residual weakness of any kind. The anæsthesia also disappeared, but the active, deep reflexes continued, although slightly less lively. In this state of improvement the child left the hospital in about a month.

A few weeks later she had a second attack, also ushered in with acute symptoms, such as headache, vomiting, and a temperature of 103°. The fever subsided in a few days and left the patient with paralysis of the left arm and left side of the face. The legs were not affected; the patient could walk well, although at first there seemed to be a little weakness of the left leg; but, if so, it soon disappeared. This second attack, so unlike the first, was evidently due to a cerebral lesion. The cranial nerves were not involved. The facial paralysis slowly improved, but the brachial monoplegia persisted.

At the present time, six months after the onset, the arm is paralyzed and the seat of a constant, irregular tremor, increased on movement. This tremor somewhat suggests the possibility of a lenticular lesion, as it is not unlike the movements described by Kinnier Wilson. There is no muscular atrophy, and the tendon reflexes at the wrist and elbow are increased. The gait is not hemiplegic; in fact, both legs are normal. There is no heart lesion to suggest the possibility of embolus.

How to associate these two attacks, with such distinct forms of paralysis, occurring within a few weeks, is the problem. A specific infection is naturally thought of, but the child does not present the appearance of hereditary syphilis. The father denies specific infection. The mother has had several healthy children. Moreover, the tests of the spinal fluid were negative. The acute onset, with fever, etc., is what we see in poliomyelitis. In this disease, however, a second attack, following soon upon the first, is, so far as I know, most unusual.

Spinal syphilis, causing such an extensive lesion of the spinal cord, does not recede so completely as in this case. It is almost sure to leave permanent damage, and it has not such an acute onset.

Disseminated sclerosis, which might be thought of in this connection, has not such an acute onset. Moreover, this patient has no nystagmus or speech defects.

In Pott's paraplegia a deformity of the spine would surely be detected, and the X-ray would reveal a lesion of the vertebræ. Nothing of this kind was found here, and the later history does not support this diagnosis.

The second attack, with its acute initial symptoms and the evidence of a lesion in the brain, answers to the description of the polioencephalitis of Strümpell. Clinically, the patient presents a form of cerebral palsy of childhood. This lesion is probably basal; and from the character of the motor disorder it may be lenticular.

THE DIAGNOSIS OF DISEASES THAT HAVE PROGRESSIVE MUSCULAR ATROPHY AS THEIR MOST CONSPICUOUS SYMPTOM *

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Conspicuous, incapacitating, widespread atrophy of the muscles of the limbs, of the trunk, and of the head and neck occurs as a symptom of many diseases, notably of myositis and muscular dystrophy, multiple neuritis, poliomyelitis, chronic degeneration of the multipolar cells of the anterior horns of the spinal cord, dependent upon various unknown processes (spinal progressive muscular atrophy and its bulbar analogue, glossolabiolaryngeal paralysis), syringomyelia, and chronic intoxications and infections of those cells. A simple diagram will illuminate this statement.

Lesion A—Myositis and dystrophy.
Lesion B—Neuritis of several nerves. Multiple neuritis.
Lesion C—Root neuritis (strangling of the motor roots by various forms of meningitis, especially pachymeningitis, and occasionally by new growths.
Lesion D—Poliomyelitis, acute or chronic, "idiopathic" spinal muscular atrophy, amyotrophic lateral sclerosis (if the peripheral pathway of the central motor neuron, the so-called spinal pyramidal tracts, are involved). Lesion D is often produced by a peculiar glial proliferation and degeneration leading to cavity formation in the cord, called syringomyelia, and by a form of myelitis not yet adequately described.

These various diseases have special symptomatic features which permit the practitioner to diagnosticate them correctly in many instances, if he will but elicit carefully the " story " of the patients and analyze the symptoms. For instance, in the majority of cases of multiple neuritis, pain is a marked symptom. So it is in myositis, but the former is conspicuously associated with a history of alcoholic consump-

* A clinical lecture delivered at the Neurological Institute of New York.

tion, or sequential to infection such as influenza. The latter is associated with metabolic disorder, such as gout and chronic infection that passes under the euphemism " rheumatism," and upon parasitic infection, which is readily suggested, and the roadway to its detection indicated by the presence of an excess of eosinophiles in the blood. The differentiation offers difficulties, but not obstacles. So, likewise, the onset of poliomyelitis and the course of the disease are very characteristic. Chronic poliomyelitis, on the other hand, has no special characteristics and must be diagnosticated by the process of exclusion,—that is, by eliminating the other diseases that parallel it symptomatically. Extensive muscular atrophy is a striking feature of amyotrophic lateral sclerosis. It is, however, associated with spasticity and rigidity which are almost pathognomonic. In the same way syringomyelia, which is often attended with widespread muscular atrophy, can be diagnosticated readily if the so-called pathognomonic sensory disturbances thermo-anæsthesia and thermo-analgesia exist.

Despite these general rules and their applicability, we encounter many cases in which the diagnosis cannot readily be made, and even after we have ventured one we are not sure that postmortem examination will corroborate it. Here are a number of such instances, in studying which a likely diagnosis, at least, may be arrived at.

SYPHILITIC ROOT NEURITIS

The patient, a tailor, 39 years old, was well until May, 1909. About that date he lifted a heavy bag, and while so doing he felt " something tear in the heart and I thought I was gone." Two days later he complained of severe pain in the right shoulder blade and noted some difficulty in raising the right upper extremity at the shoulder. After a few days the pain subsided, but there has since been inability to raise the right upper extremity properly.

Four months later, August, 1909, the left shoulder and arm began to be weak, and in the course of a few days he had difficulty in elevating this shoulder. With the extension of the disease into the left shoulder there seemed to have been no pain, and, indeed, aside from the pain which he had shortly after lifting the heavy bag, there had been no pain since until four weeks before he came under our observation, November 7, 1910. On that date his complaints were: (1) Inability to raise the right or left arm from the shoulder. The

right had been affected for eighteen months, the left for twelve. (2) Frequent attacks of pain, apparently in the shoulder-blades. The pain ascended the spine and into the occiput, relief being obtained by rubbing or squeezing, or by holding his arms above his head. (3) Insomnia: awakened from sleep by the pain in the head, mainly in the occiput. Frequently was kept awake all night. These are the spontaneous or voluntary statements of the patient. It was the painful attacks alone which caused him to seek relief in the hospital. He said the weakness in the shoulder had not inconvenienced him much; he was still able to keep up his work, but the pain was too distressing.

On further questioning, he said he had occasional difficulty in swallowing, and " some weakness and pain in the heart." Two weeks before admission he had some difficulty of speech lasting for ten minutes. He could not find the words he wanted. In trying to relate to his relatives some account of his trouble, he found the greatest difficulty for ten minutes, mispronouncing words and using others which he did not intend to use. This recurred the same day, for about ten minutes, but since that time he has not been bothered. He has had no difficulty in walking; he was strong and well and weighed 154 pounds; was able to do skilful work, garment making, with the hands, but the left-hand grip was growing weaker. His bladder control good, bowels regular. Vision was good, but when he had the severest pains he said the vision was poor in the lateral fields. This was not, however, continued for any great length of time.

Physical examination at that time showed atrophy, indicated by the accompanying illustrations, Figs. 1 and 2. The tendon-jerks all over the body were lively, but with no real pathological increase. The skin reflexes were all present and normal; the plantar reflex was of the flexor type and no Babinski phenomena. The pupils were equal and presented a sluggish reaction to light; nevertheless, they responded. The condition was one which seemed to justify the statement that they were beginning to show the Argyll-Robertson phenomenon. There was no disturbance of any form of sensibility.

The electrical reactions of the atrophied muscles were those of reaction of degeneration,—that is, no faradic reaction in the muscles most profoundly atrophied, weak response in those less atrophied, with typical qualitative changes in the atrophying and atrophied muscles.

The Wassermann test was weakly positive, a state which I interpret as a negative reaction unless associated with symptoms that are " clinically " of a syphilitic nature. It may be said in this connection that the patient had a chancre fifteen years ago with the customary manifestations. At that time he had received no systematic treatment, and, so far as could be learned, no treatment after that time. The only indication that the disease was dependent upon a syphilosis of some nature was that the cerebrospinal fluid showed 45 lymphocytes and excess of globulin, and that it reduced Fehling's solution. In other words, three of the four so-called luetic reactions of the cerebrospinal fluid were positive.

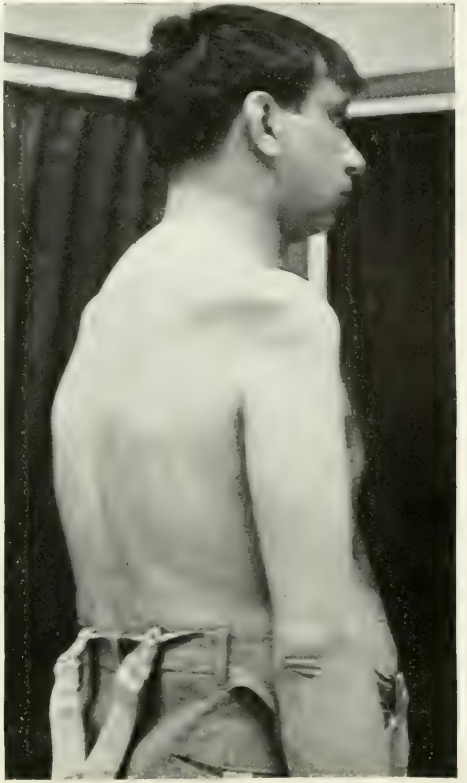
We were suspicious that we were dealing with amyotrophic lateral sclerosis. The distribution of the atrophy, the rapidity of its development, the exaggeration of the tendon-jerks, all seemed to suggest this diagnosis. The cerebrospinal fluid findings, however, were so suggestive of syphilitic disorder that we determined to put him on antisyphilitic treatment, and he received at this time an intravenous injection of salvarsan. On February 25, 1911,—that is, three months later,—there was practically no change in his condition; the Wassermann test was negative. The cerebrospinal fluid gave the Wassermann negative, globulin plus, lymphocytes 38, and Fehling's plus.

We lost sight of him until January 9, 1913, when he returned, saying that he was feeling well and strong, his one complaint being inability to use his arms. The general physical condition on that date was practically the same as on previous examination, and, although he says he feels twitching all over his body, particularly in the shoulder muscles, no fibrillation was to be seen. The most noteworthy change, however, was now found in his blood and cerebrospinal fluid, which was: Serum Wassermann +; cerebrospinal fluid Wassermann +; gobulin +; cells 32; Fehling's reaction +. In other words, he presented a most typical and characteristic serological picture of syphilis. Aside from this, there is nothing requiring repetition from what has been said before relative to his physical signs. He was then given two injections of neosalvarsan and put on mercurial injections. After a month his blood Wassermann was negative. He came under observation again about a month ago. There has been no particular change in his clinical manifestations. He is

Fig. 1.

Anterior view of patient affected with syphilitic root neuritis.

Fig. 2.

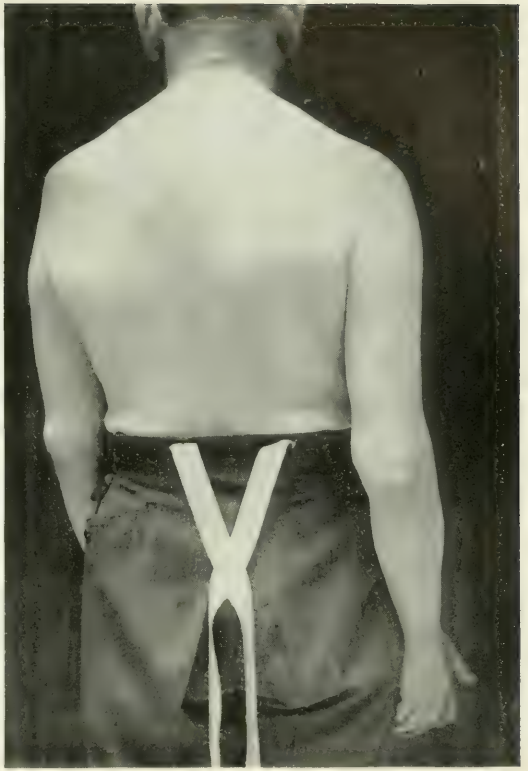


Posterolateral view of the patient seen in Fig. 1.

Fig. 3.

Progressive muscular atrophy dependent upon destruction of the anterior horn cells, and showing atrophy of both thenar and hypothenar eminences.

Fig. 4.



Posterior view of the same patient.

able to work so long as the work does not call for the use of his shoulder girdle muscles. The laboratory report of his serum and cerebrospinal fluid is negative.

The interpretation to be put on this case is that a syphilitic lesion of the nature of a root neuritis of the meninges, comprising the anterior roots of the lower dorsal and upper dorsal segments of the cord, has practically strangled the motor neurons going to the atrophied muscles. It is quite possible that had this condition been recognized at the onset of the symptoms, and the patient put upon appropriate and active antisyphilitic treatment, the course of the disease, at least, might have been profoundly influenced in the right direction. It is scarcely conceivable that reparation should take place in the peripheral motor neurons that have undergone such destructive change as they have.

SYPHILITIC ROOT NEURITIS RESEMBLING THE ARAN-DUCHENNE TYPE OF PROGRESSIVE MUSCULAR ATROPHY

It would be difficult to find a more instructive example of progressive muscular atrophy due to the involvement of the anterior root nerves in a syphilitic process, probably of the meninges primarily and of the roots secondarily, than that of a woman, 51 years old, who came to the Neurological Institute early in 1912. Her complaint was that she was unable to grasp or pick up small objects, or, if she succeeded in picking them up, she could not hold them. She was no longer able to use a knife and fork properly, or to comb her hair, and she had to forego sewing and other occupations requiring dexterity or strength. Both hands were affected, but the right more than the left. She complained also of a fluttering sensation in the right shoulder-blade; of a sensation of pins and needles in the tips of fingers at times. These were not constant. At times her hands felt swollen, and there was often a disagreeable burning sensation on the outer surface of the right hand.

These symptoms had existed for a year. They were thought to be stationary in the left hand and advancing in the right: development was gradual and could not be attributed to anything. Examination showed conspicuous atrophy of the adductors of the thumbs; the first interosseous space was very thin and the extensors of the forearm distinctly atrophied. The fingers were semiflexed, the entire

hand "claw-shape"; the grasp of the hand was very weak, their prehensibility almost *nil*. The fingers of either hand could not be extended, and she could approximate only the index and middle fingers of the thumb. Electrical examination of the affected muscles showed a quantitative diminution of irritability; all the atrophied muscles could be made to respond to a strong faradic current.

Further physical examination was negative. At no time was any disorder of sensation elicited. The Wassermann test applied to the blood-serum, February 3, 1912, gave a very strong positive reaction. She was given 0.6 gramme salvarsan, and two weeks later reported decided improvement of the "motor" symptoms; *i.e.*, she said she could use a knife and fork and could comb her hair. She was not seen again until April 8, 1912. The improvement that she claimed after the first salvarsan injection had vanished. The reaction of the serum was positive, and another injection of 0.6 gramme salvarsan was given; then after a fortnight a third, and after that she was given salicylate of mercury (1½ to 2 grains), suspended in benzoinol, intramuscularly, once a week during the summer of 1912. There was very little change in her physical condition, and in October, 1912, the Wassermann reaction of the serum was positive. She was then given a fourth injection of salvarsan, followed by another course of injections of mercury, and from that time dated her recovery. She returned in March, 1914, to let us see how well she was. The Wassermann reaction of the serum was then negative. It is negative at the present time, October 12, 1914, and she considers herself quite well. She can wash, iron, sew, use knife and fork dexterously, and, in fact, do everything she was accustomed to do before her hands became affected. Examination shows that she flexes and extends the hands readily and vigorously. The fingers tend to remain in a slightly semiflexed state, and she can extend the thumb and index-finger only by voluntary effort. The middle finger is more flexed than any of the others, and the flexion is principally at the first phalangeal articulation. The grip of the hands is strong. Flatness of the thenar eminences and thinness of the first interosseous space are still to be seen. Subjective symptoms have long since disappeared.

This case is a most instructive one. Formerly it would have been looked upon as an example of so-called Aran-Duchenne type of progressive muscular atrophy, rather atypical, perhaps, because of the

subjective sensory disturbances. Experience has made me suspicious of syphilitic lesion in every instance in which slowly progressive muscular atrophy, particularly of symmetrical distribution, occurs, and the probable diagnosis of syphilitic pachymeningitis, causing in turn a root neuritis or strangulation state of the anterior horn roots, was suggested even before corroborated by the Wassermann test.

Notwithstanding the fact that many cases of progressive muscular atrophy which we encounter can finally be satisfactorily diagnosticated and classified, we meet every now and then a case that baffles. Such cases the general practitioner finds difficult, for he can find nothing in the literature accessible to him that they parallel or even closely resemble. Indeed, it is not at all certain that such cases can be correctly interpreted in their early stages.

PROGRESSIVE MUSCULAR ATROPHY DEPENDENT UPON DESTRUCTION OF THE ANTERIOR HORN CELLS POSSIBLY DUE TO SYRINGOMYELIA

An instance is that of a woman school teacher, 46 years old, who is in the hospital now. Her complaint is that, beginning about May, 1913, she gradually lost power in the lower extremities until now she is nearly unable to stand or walk. Meanwhile her legs and thighs have grown thin and are the seat of disagreeable, involuntary movements or twitchings of the muscles (fibrillation). She has encountered no experience to which her infirmity can be attributed. The manner in which her symptoms developed seems to be about as follows: In May, 1913, she "sprained" the left ankle. She attributed this to wearing low shoes, to which she was not habituated. She did her school work and walked without aid, conscious that the left foot was weak. During the vacation of 1913 she went about as usual, having to exercise care only on going down stairs, stepping on and off a tram car, etc. About Christmas, 1913, she "sprained" the right ankle, and a month later was obliged to use a cane. She had at this time a tingling, burning sensation on the plantar surface of the second toe, which she at first attributed to a stone bruise or something similar, but, as she had this off and on for two or three years, and had attributed it to wearing improper shoes, rubbers, etc., she did not give particular heed to it, even though it was often very dis-

agreeable. In February, 1914, her legs began to feel very weak, especially when she stood at the blackboard, and about this time she noticed twitching of the muscles of the legs—first of the thigh muscles, later of the leg muscles. She complained of "cramp" of the thigh and calf muscles, and even of the hand muscles, particularly when she vigorously extended the fingers. Gradually her lower extremities grew weaker, and at the onset of the summer of 1914 she had to drag her feet after her when she attempted to walk. On attempting to go down stairs and on taking a stride it was difficult to straighten the lower extremities at the knee. They felt as if they would close up at the knees jack-knife fashion. She had great difficulty in rising, and had to help herself with the other extremities. There may have been some difficulty in retaining the urine about this time, but the impression one gets is that there was no real disturbance of the bowels and bladder. The trembling sensation in the muscles continued, and the quivering (which caused no movement of the limbs, however) was readily to be seen.

When she came to the hospital, July 7, 1914, she walked, most insecurely, aided by a stick. When she lay in bed on her back both feet dropped forward and she had very little power to extend them. The anterior tibial and femoral muscles were markedly atrophic and flaccid. When she lay face downward she could flex the knees with considerable strength, but the weakness and atrophy of the posterior femoral muscles, and to a lesser degree of the leg muscles, were very obvious. The tendon-jerks were all elicitable, somewhat lively, especially the knee-jerks. There was no suspicion of the Babinski big-toe phenomenon. The cutaneous reflexes were all normal. Careful and repeated testing of the tactile, thermal, postural, and pain sensibility revealed no disorder of sensation, nor were the special senses in any way disturbed. At intervals during the examination she complained of cramp in the calves and in the anterior femoral muscles, and the fibrillation or fibrillary tremor in these parts was conspicuous. She had felt these also, she said, in the thenar eminences and in the peribuccal muscles, but they were not observed by the examiner, nor was there any weakness of these parts. Electrical examination of the affected muscles showed the so-called partial reaction of degeneration; that is, a contraction could be caused by very strong faradic current, and the contraction resulting from application of the galvanic current

was stronger on application of the positive pole to the atrophied muscles. Her symptoms have gradually grown worse with increased incapacitation, so now she can scarcely stand or take a step unaided. The past few days she has remarked weakness of the left thumb and forefinger and there is fibrillation of the muscles of the back. The only striking objective change is that the tendon-jerks of the lower extremities especially have grown more lively, so it may truthfully be said that they are exaggerated, but there is no big-toe phenomenon. The blood, cerebrospinal fluid, and excretions show no abnormality.

The lesion in this case is obviously in the peripheral motor neuron, and from consideration of the manner in which the disease was developed and the clinical phenomena, more especially the fibrillation of the muscles, it can be said with certainty that the primary pathological process is in the anterior horns of the spinal gray matter. One might at first be inclined to call it a chronic anterior poliomyelitis, but, reflecting on the fibrillation and the gradually increasing myotatic irritability evidenced by the exaltation of the tendon-jerks, I am forced to believe that the lesion already involves the synapses of the primary motor neuron at its termination around the anterior horn cells and implicates the axis cylinder prolongation of these neurons cellulipetally toward the pyramidal tracts, the lesion thus approximating that found in amyotrophic lateral sclerosis, though not yet causing decay of the pyramidal tracts, for, if such had resulted, the constant phenomenon—extension of the big toe on scratching the sole—would be present.

It is interesting to conjecture what the most likely lesion is that would cause the symptoms which this patient has, and the way in which they are developed and associated. It seems to me that in the absence of all evidences of an inflammatory process, and of the action of injurious agency such as lead and arsenic, the most plausible lesion, particularly in view of the fact that there has existed from the beginning and still exist subjective sensory phenomena, *viz.*, burning pain in the right foot, is a myelosyringosis. I am led to this belief particularly from examination of the literature which reveals similar instances, and in which the characteristic lesions of syringomyelia were found after death.

G. Rossolimo, of Moscow,[1] published a case which resembles very

[1] *Neurologisches Centralblatt*, 1903, No. 9, p. 388.

closely the one under discussion. The phenomena were of the upper extremities, but in every other respect it was quite parallel. The typical lesion of syringomyelia was found when the cord was examined microscopically. The cavity had the form of a tube tapering gradually toward both ends. It began at the level of the second cervical and reached to the level of the first dorsal root. On cross-section the cavity formation was seen flattened anteroposteriorly, especially at the level of the third cervical region, where it reached its greatest diameter. At the level of the third cervical root it extended on the right side into a part of the posterior segment of the anterior horn; on the left it not only involved this region but also spread into the posterior horn. In the remaining cord segments, located behind the central canal in the posterior commissure and penetrating into the anterior segment of the posterior column, it was more on the left half of the cord and barely extended to the base of the posterior horns.

The cavity was surrounded by newly-formed tissue equally thick along the whole circumference of the tube. On cross-section the cavity was seen to be surrounded by this tissue like a ring. The newly-formed tissue was composed of two strata of different structure; the inner stratum, abutting immediately on the cavity, consisted of a wide-meshed network of glial fibres which lay closer together on the edge of the cavity, whereby the inner wall of the latter appeared quite smooth. Within the fibre net there were a small number of glial cells with small nuclei and fine processes. At the level of the third cervical root, where the cavity reached its greatest dimensions, the inner stratum of gliosis on the right side of the cavity showed a very high grade of compactness, demarcating it sharply from the surrounding tissue, taking no stain, and running into the syringomyelia cavity in the form of festoons. The outer stratum possesses a different structure, is a relatively firm glial fibre tissue with predominantly radiary formation—oval for the most part, with its long axis likewise radiary.

In the central canal there was everywhere a proliferation of the endothelium which filled it up irregularly with clumps of cells. The glial proliferation was in most intimate relationship to the central canal. The vessels of the cord and roots were markedly hyperæmic, especially those of the anterior horn; the perivascular spaces were

markedly widened. In certain of the vessels there was a slight small cell infiltration.

The nerve-cells of the anterior horn showed in all segments a picture of most profound alteration, consisting of different grades of atrophy, chromatolysis, alteration of cell size, destruction and atrophy of the processes, and slight residues of cells in the form of structureless lumps. The diminution in the number of cells reached such a degree that only exceptionally did one see more than six or seven cells, of which two or three might be normal. The cells of Clark's columns and of the posterior horns showed no abnormalities, quantitative or qualitative.

The alterations of the myelin fibres were restricted almost exclusively to the intramedullary portions of the anterior roots, the whole length of the cord, where the fibres were markedly degenerated. The posterior roots were completely spared in their intramedullary segment. The fibres of the anterior commissure were markedly diminished in number. The white substance of the cord was not altogether spared. In the upper segments of the cervical cord there was bilateral degeneration of Schultze's fibres, and in the whole course of the cervical segments an atrophy of the fibres of Goll's column on the left.

The neuroglia showed marked alterations—a marked hyperplasia —consisting of development of the fibre net, increase of spider-cells, and nuclei. In the cervical and, especially, lumbar enlargements, the anterior horns were filled with proliferated glia. The extramedullary portions of the anterior root showed considerable diminution in quantity of fibres. The posterior roots presented a normal picture in every respect.

The patient, a man 35 years old, who had been ill 18 months, complained of weakness of all four extremities and of slight pains in the upper extremity. The weakness progressed steadily, and four months after its onset atrophy of the muscles of the left upper extremity was noted, and a month later fibrillary twitchings in the region of the first interosseous muscle, which, three months later, already showed a deep depression. Five months after the onset there was noted weakness in the left hip-joint, and a month later similar weakness in the right leg. During the next five months there was progressive weakness of these three extremities, and then the right arm became

weaker, associated with sensation of heat and dull pain in forearm. Thirteen months after the onset there were recurrent cramp-like contractures of the right hand, and a month later voluntary movement of the feet was impossible. The next month weakness of the neck muscles and a sensation of cold in the soles of the feet appeared. The patient became unable to sit up without support, and quite unable to stand or walk. Fibrillary twitchings were remarked in all the atrophic muscles. The muscular atrophy was mostly of the shoulder girdle, especially the left, and in both upper extremities. The atrophy gradually diminished, going distally. Least atrophic were the extensors of the thighs, the gluteal muscles, and the lower muscles of the back. The mechanical irritability of the less atrophic muscles was rather lively. Galvanic irritability showed marked quantitative diminution, while in all the markedly atrophic muscles there was no faradic irritability. The patellar jerks were increased, the Achilles obtainable, the biceps and triceps jerks on right definite, on left diminished; cremaster, abdominal, and plantar reflexes weak. There were no objective disturbances of sensibility, but a very slight diminution of pain sensation of the end phalanges of three ulnar fingers of the left hand, and slight cyanosis of the hands and feet, especially the left hand.

The salient features of this case were gradual progressive weakness of the extremities, and muscular atrophy, which was not restricted to the territory of the peripheral nerves. The diagnosis of chronic anterior poliomyelitis seemed most probable, but the pain, slight though it was, the sensitiveness of the nerve-trunks, and eventually the hypoæsthesias of the end phalanges of the three ulnar fingers of the left hand strongly suggested neuritis. The increased patellar reflexes and cyanosis of the hands and feet might also be fitted into the frame of poliomyelitis, the former having first been observed by Darkschewitch and Schuster, the "main succulante" by Dejerine. The diagnosis of syringomyelia did not occur to the reporter, and, though the symptoms might be explained by a cavity, yet he thinks it unlikely that in analogous cases these symptoms alone might lead to the diagnosis. In fact, the diagnosis of syringomyelia with symptoms of even greater definiteness would be made with difficulty. If the progressive spinal atrophy were the dominating symptom, the symptoms of syringomyelia, weak and not particularly charac-

teristic, then one would diagnosticate most readily chronic poliomyelitis in combination with certain other individual peculiarities—coincident polyneuritic, sclerosis of the posterior columns, amyotrophic lateral sclerosis, etc. On the other hand, were the symptoms of central gliomatosis in the foreground and the muscle atrophy extended far over the boundaries of the cardinal symptoms of syringomyelia, then the diagnosis would be directed entirely upon the latter, explaining the atrophy through predominant localization at certain levels in the anterior horns of the cord.

Rossolimo states that he has investigated six cases of chronic anterior poliomyelitis from a pathological and anatomical standpoint. All these point to inflammatory affection of the anterior horns of the cord—hyperæmia, small cell infiltration in the region of vessels, increase of glial tissue and spider-cells associated with disappearance of the cells and fibres of the anterior horns. In all six cases the pathological changes have been essentially the same, in that they point positively to an inflammatory, not degenerative, process. In the cases already reported of the association of progressive spinal atrophy with central gliosis the association has been regarded as an accidental coincidence, without any effort being made to determine a genetic relationship (Kahler and Pick Hoffman). He would also regard the coincidence as accidental, were it not for statistics, for now there exist, all told, nine described cases of chronic anterior poliomyelitis—six simple and three complicated of syringomyelia (33 per cent.).

I have quoted this case in considerable detail because it so closely parallels the one I describe, and because of the absence of the objective symptom which is so universally held to be pathognomonic of syringomyelia, *viz.*, disassociation of sensibility, preservation of tactile and loss of thermal sensibility. To be sure, this sign is found in the majority of the cases of syringomyelia, especially after the disease has existed for some time, but there are a great many cases in which it does not occur. A moment's reflection while looking at the accompanying diagram will make this quite clear. If the cavity formation in the gray matter is ventral and lateral to the central canal, the symptoms must necessarily be atrophic with manifestations of irritation of the anterior horn cells—muscle fibrillation.

As a matter of fact, I think I am justified in saying that in every

case in which muscular atrophy (clinically weakness, lameness, paralysis), at first unilateral in its display, then bilateral, beginning at the ends of the extremities and gradually extending toward the trunk, and fibrillary tremor of the muscles, are the sole symptoms, syringomyelia should always be strongly suspected when syphilis and the metallic poisons can be excluded and when pronounced spasticity does not exist. For instance, I suspect that the lesion of syringomyelia may possibly be responsible for the symptoms which the man whom I now show and who is at present in the hospital diagnosticated as amyotrophic lateral sclerosis. I suspect it for two very good reasons: First, he has been ill for upward of two years, but is, nevertheless, little incapacitated; and, second, he does not display that symptom—marked spasticity expressed in feature, gait, and action—which every case that I have verified by necroscopical examination has displayed. Against such diagnosis is his age and the absence of sensory disturbances. He is 57 years old and gradually developed weakness and wasting of the hands, involuntary twitching of the muscles of the upper extremities and shoulders, followed by weakness and atrophy. He says that two years or more ago he had sudden twitching and sharp pain in the left arm and forearm which caused flexion of the forearm. Soon afterward he remarked that he could not pick up small objects with the left hand, and later that there was wasting of the left thenar and hypothenar eminences. After that the grip of the left gradually failed and the forearm grew weak and thin. Two months ago involuntary twitchings in the right upper extremity began, and, soon after that, weakness and atrophy of the right hand. Examination shows (Figs. 3 and 4) atrophy of both thenar and hypothenar eminences, the left more advanced than the right, conspicuous interosseous spaces due to atrophy of the muscles, inability to extend the fingers, loss of grasp, shrunken forearms, flattening of the shoulders, conspicuous weakness of the deltoids, especially of the left. There is a reaction of degeneration in the opponens flexor brevis and adductor brevis pollicis of both hands; no response whatsoever in the flexor and abductor minimi digiti, and diminished irritability to the faradic current in the atrophied muscles of the forearm. All the tendon-jerks of the lower extremities are lively, though scarcely pathologically exalted, while those of the upper extremities and jaw are normal. The cutaneous reflexes are quite normal, save the right epigastric, which I have not

been able to elicit. There is no disorder of sensation or of the special senses, nor does he complain of pain or paræsthesia. The sphincters are intact. The blood and cerebrospinal fluid are quite normal, and there is no evidence of spasticity or rigidity.

I do not say that one is justified in making the diagnosis of syringomyelia in this case, as is, I believe, in the case of the school teacher; but, in view of what has been said, syringomyelia should be kept in mind while we are on the lookout for the advent of symptoms that will deny or make certain the suspicion. Syringomyelia is a commoner disease than we admit it to be. Sooner or later we shall diagnosticate " a typical " instance of it, just as we now diagnosticate " atypical " disseminated sclerosis. It should at once be taken from the realm of medical curiosities.

There is less field for application of rules of thumb in the diagnosis of the chronic progressive muscular atrophies than in any other class of diseases. Each case must be studied meticulously and analyzed carefully. Much valuable information may be obtained from the study of the mode of onset and progression of symptoms. The facts elicited should then be weighed with a diagram of a cross-section of the spinal cord either before one or in the mind's eye. After repeated examination and deliberation, the probable or certain diagnosis will soon become obvious, especially if the searcher after light contrasts his problem with carefully-studied published cases substantiated by necropsy.

THE MOST VALUABLE DRUGS OF VEGETABLE ORIGIN

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It is an interesting subject for discussion to consider which drugs of the pharmacopœia are most useful, and which in comparison with these are practically useless, and may without much loss be neglected and forgotten.

Previous to fifty years ago the majority of the drugs included in the Pharmacopœia, and generally used by physicians, were derived from the vegetable kingdom. During recent decades a very large number of preparations made by chemical manipulation, derived from animal bodies, or cultivated in bacteriological laboratories have been introduced as remedies for the treatment of disease, so that now the drugs of vegetable origin occupy a much less prominent position in therapeutics.

Careful study, with the aid of modern scientific methods, has demonstrated that many of the vegetable drugs formerly held in high esteem by successful practitioners might be entirely discarded and their places filled by other drugs of the same class which have a more definitely established beneficial action. If a moderate number of the more useful drugs can be selected, and if the selection can receive the stamp of general approval by the profession, it will prove of advantage in several ways.

1. The medical student will have a shorter list of vegetable drugs upon which to concentrate his attention while studying, and to remember while preparing for examination.

2. The practitioner will be relieved of much perplexity in trying to keep in mind a vast number of preparations of doubtful utility.

3. The pharmacist will have to carry in stock a smaller line of the preparations made from plants which are seldom prescribed.

4. The teacher and investigator will have more time to acquire by research, and to teach definite facts in regard to the drugs which have positive value.

OPIUM

Opium, including its most important alkaloid, morphine, is one of the oldest, one of the most used, the most invaluable, and at the same time the most dangerous of all drugs. It is impossible to forget the pitiable results, in the development of the opium habit, which have many times followed its careless prescription; nor the surgical cases in which the delay in operating, encouraged by the masking of symptoms by its use for the relief of pain, has not infrequently been followed by a fatal result, because the operation was finally performed too late.

As a destroyer of pain it is unsurpassed. No other drug is at all equal to it. In the various colics, whether hepatic, renal, or intestinal, there is no satisfactory substitute for it. In many acute inflammatory and infectious diseases accompanied with pain its administration brings comfort and rest with great benefit to the patient. Used as a diaphoretic with ipecac or camphor, as in the well-known Dover's or Tully's powders, it is most useful. In acute neuralgia it affords the greatest relief. It should not be used in chronic neuralgia on account of the danger of inducing the drug habit. The prompt administration of the alkaloid morphine, with the hypodermatic syringe, in angina pectoris, formerly regarded as a neuralgic affection, generally brings speedy relief and frequently saves life.

By diminishing the action of the muscular coat of the intestine and lessening peristalsis it is more useful than any other drug in the treatment of diarrhœa, after the alimentary canal has been emptied of irritating substances. As an adjuvant in producing and maintaining anæsthesia by the administration of ether, a hypodermatic injection of morphine is exceedingly useful. These statements suggest only a few of the more striking of the beneficial effects of opium and its alkaloid. Many more will occur to every reader. But the other side of the picture must not be forgotten. While its proper use is indispensable, used unwisely it produces effects which are indescribably bad. Every one who prescribes the drug should always bear this in mind, and never allow his patient to become addicted to its habitual use. Never should a patient be allowed to administer a hypodermatic injection to himself. Rarely should a prescription for morphine be given a patient. The safer plan is for the physician always

to dispense it himself, and to refrain from telling the patient what he is receiving. The only case in which the patient should be allowed to become an habitual user of opium or morphine is perhaps one of incurable cancer. Here it would be cruel to deny him the relief and comfort which no other drug can give. As soon as the investigations of to-day—and to-morrow—give to the profession the means of curing this most terrible of diseases, even this exception will no longer be justifiable.

QUININE

Quinine, the alkaloid obtained from cinchona, has most important uses. Opium may be regarded as a specific—not for a disease, but for a symptom—pain. Quinine, on the other hand, is a genuine specific for those diseases which are now known to be caused by the *Plasmodium malariæ.* The power of this drug over these forms of disease was known long before their cause was known—long before the protozoön which causes them had been discovered. Those who fortunately have never lived in a so-called malarial region cannot realize the inestimable value of this drug in curing affections caused by malarial infection. One who has himself passed through the various stages of chilliness, coldness and shivering or shaking, followed by the burning fever and terrible headache, and this in turn by the drenching perspiration and accompanying prostration and exhaustion, and who, when he awakes the next morning, realizes that the same thing will happen again in twenty-four or forty-eight hours unless something is done, and who then knows that the repetition can be prevented by taking a few capsules of quinine, will not be likely to attempt to deny to quinine a place very near to the head of the list of drugs.

ACONITE

Aconite was the subject of highest commendation by Sidney Ringer, who wrote, in the tenth edition of his "Hand-book of Therapeutics," published in 1883: "Perhaps no drug is more valuable than aconite." To-day he might write: "Perhaps no once popular drug is so lightly esteemed." It superseded to some extent the use of Dover's and Tully's powders, and has in turn been displaced to a considerable extent by antipyrine, phenacetine, and acetanilide. It

is just as useful to-day as it ever was, and in most cases is just as good as, and somewhat safer than, other drugs or combinations of drugs which are used to meet similar indications. Its most important use is in the early stages of inflammatory or infectious diseases, accompanied with fever. While in recent years attempts have been made to discredit it, and to prove that it did not accomplish the results which it has been believed to effect, yet the experience of careful physicians, who have used a reliable preparation of the drug systematically in a considerable number of cases, has led many to the conviction that it is a most useful drug, and, if its effects are carefully watched, a very safe drug. It often appears to reduce fever, to slow the pulse, to relieve aching and restlessness, to promote perspiration, and to diminish the overaction of the heart in inflammation and fever. Its action, when externally applied, in relieving local pains, and its general action in relieving neuralgia increase its claim for high therapeutic rank.

DIGITALIS

Digitalis has an action in some respects the opposite of aconite. The latter appears to have a depressing action on the heart. Digitalis appears to have the opposite effect. This drug, on account of its universally recognized action in slowing and strengthening the action of the heart, is fairly entitled to be considered a cardiac tonic. In many cases of what it is the fashion to call failure of cardiac compensation, especially in valvular disease accompanied with dilatation of the chambers of the heart, the action of digitalis, by strengthening the contraction of the cardiac muscle and lengthening the diastole, enables the circulation to go on more actively, and, incidentally, causes a diminution of œdema, increases the secretion of urine, and relieves the dyspnœa in a way which, if one hesitates to call it miraculous, is at least astonishing and very gratifying. Equally striking results cannot be obtained so promptly, in cases in which it is indicated, by rest in bed, by graduated exercises, or by any of the so-called substitutes for digitalis. Of course, it would be unreasonable to expect that every case of heart-disease can be cured by digitalis. In cases in which there is pronounced myocardial degeneration or advanced degeneration of the coronary arteries digitalis must be prescribed with extreme caution.

ERGOT

Ergot, on account of its action upon the circulation through the unstriped muscular system, and especially the muscular fibres of the uterus, occupies a unique sphere of usefulness. In uterine hemorrhage, and especially in that following parturition, ergot has an important action, both prophylactic and curative. Too much, of course, must not be expected of it, for it will not cure every case of uterine hemorrhage, but in many cases, when the bleeding is due to relaxation of the uterine walls and vessels, it will produce most gratifying results. As to its value in diminishing congestion or hyperæmia of the central nervous system, and in controlling pulmonary hemorrhage, there is some difference of opinion among competent medical observers, not a few of whom, however, are convinced of its great usefulness in many cases of hæmoptysis, exclusive, of course, of those profuse hemorrhages from large vessels which rapidly produce a fatal result.

IPECAC

Ipecac is an invaluable remedy in affections of the respiratory organs. Whether used as an emetic for the relief of the so-called spasmodic croup, where its action in a short time changes a most distressing condition into one of quiet and comfort, or, in smaller repeated doses, to relieve hoarseness and the irritation which results in cough, and to produce what is commonly spoken of as loosening of the cough, with easier and more abundant expectoration, it has a range of useful action which is not equalled by any drug which can be used with equal safety.

BELLADONNA

Belladonna, on the other hand, produces an effect in the pathological conditions of the respiratory organs which is in some respects the opposite of that of ipecac. Given in carefully adjusted doses it causes a diminution of secretion, as seen especially in rhinitis, accompanied with profuse watery secretion from the nasal mucous membrane. This action is utilized in the extensively used rhinitis tablets. It is also used to secure diminution of the action of the sudoriparous glands in the treatment of general hyperidrosis. In etherization its hypodermatic injection, with or without morphine, is of great value in

diminishing the secretion of mucus in the pharynx and tracheæ, which often is exceedingly annoying.

ALOES

Aloes has been so long and extensively used in the treatment of constipation, acute and chronic, that it seems better entitled to be included in this list than any other of the vegetable laxatives or cathartics. If it acts, as it is said to do, more effectively than other cathartic drugs upon the lower part of the large intestine, this is certainly an advantage, for it often happens that a laxative brings the intestinal contents down into the rectum, where they remain until some special stimulation is applied to that portion of the intestinal canal. Certain it is that no drug is superior for general use to aloes in overcoming constipation, whether acute or chronic, when acute inflammation is not present and when quick action is not necessary. In chronic constipation its use in small but adequate doses, frequently repeated, as, for example, three times a day, will frequently, by stimulating the secretion of the glands associated with the digestive organs, and by a general tonic effect upon them, establish a habit of daily movement of the bowels, so that the dose can be gradually diminished and the drug be ultimately entirely discontinued, or given only at intervals of several days.

GELSEMIUM

Gelsemium is a drug which seems never to have secured the popularity which it deserves. It is recommended in various febrile affections, especially those of malarial origin, also in hyperæmic and inflammatory affections of the central nervous system. Its greatest value is in the treatment of chronic painful affections of the nerves. In subacute and chronic forms of neuralgia, in which opium cannot be used without danger of inducing the habit, gelsemium, given in connection with such tonics as iron and quinine, often proves exceedingly beneficial.

STRYCHNINE

Strychnine, the alkaloid of nux vomica, holds the highest rank as a general tonic, and as a special tonic to the nervous, circulatory, and muscular systems. The knowledge of its striking action upon the nervous system has led to its indiscriminate prescription in all forms

of nervous diseases, in some of which it unquestionably does harm by increasing irritability and congestion. In some forms of paralysis it undoubtedly produces much benefit at certain stages of the affection. As a stimulant or tonic to a weak and debilitated heart it has enjoyed extensive popularity during the last twenty or thirty years. To-day confidence in its usefulness in acute heart weakness is perhaps somewhat less than it was five or ten years ago. As a general tonic in conditions of chronic debility, and especially in chronic impairment of the functions of the digestive organs with poor appetite, weak digestion, and constipation, it is exceedingly useful. No other drug can adequately take its place in the wide range of cases of this character in which it is indicated.

These ten drugs, of course, are not all of the drugs of vegetable origin which can be used with advantage in the treatment of disease. In individual cases, no doubt, some other drug may be substituted for one of these drugs which will fulfil the indication equally well. But for habitual use, in the ordinary cases encountered in general practice, it would be difficult to demonstrate to a jury of general practitioners that any drug not included among these ten could be substituted for one of them which would meet the indications for which it is used better than the one included among those mentioned.

It is eminently worth while that the medical profession should agree upon as many facts as possible, and while, perhaps, a very small proportion of the men in active practice would agree upon the entire number, probably most of them would agree upon the majority of the list.

While nothing original has been stated in this paper, and it is hoped that no untrue or unwarranted statements have been made, it is not improbable that some of the drugs mentioned are not much used by many practitioners, because they have been half-forgotten by men who have for various reasons been led to use other drugs to meet the indications for which the drugs mentioned are more generally used, and in many cases may be used with more satisfaction.

In the long run it is decidedly preferable to rely upon well-known drugs whose action has been at least approximately determined rather than to try every new drug which is recommended by therapeutic enthusiasts, not infrequently without adequate foundation of fact determined either by experiment or practice.

To recapitulate—the drugs of vegetable origin which are of especial value in the treatment of disease are:

1. Opium for the relief of acute pain.
2. Quinine for the cure of malarial infection.
3. Aconite in acute febrile conditions.
4. Digitalis in conditions of cardiac weakness.
5. Ergot to control hemorrhage.
6. Ipecac in respiratory disorders.
7. Belladonna to check hypersecretion of the skin and mucous membranes.
8. Aloes to promote evacuation of the intestinal contents.
9. Gelsemium for the relief of chronic nerve pains.
10. Strychnine as a general tonic.

Medicine

THE AUSCULTATORY METHOD OF BLOOD-PRESSURE DETERMINATION: A CLINICAL STUDY

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I. INTRODUCTION

If one places the cuff of a blood-pressure instrument on the arm of a patient in the usual manner, inflates it until the pulsations in the radial artery are obliterated, and then, with the bell of the stethoscope applied over the brachial artery at its point of bifurcation just below the bend of the elbow, listens while the pressure is progressively diminished within the cuff, he will hear a succession of sounds. As the pressure falls he will first hear a short, sharp, distinct tap. As the pressure falls still lower the tap will be replaced

by a loud systolic murmur; soon this murmur will disappear and the tap will return—sometimes louder and more distinct than it was heard at first. As the pressure falls still farther, suddenly the loud, distinct tap becomes decidedly less intense and finally all sounds disappear.

This method of examining the behavior of the brachial artery after its pulsations have been obliterated by air-pressure applied by the means of an inflatable cuff is known as the auscultatory method of determining blood-pressure. It was originally introduced by Korotkow,[14] in 1905.

The operator, in employing this method, notes the point on a millimetre scale, either of a mercury column or a spring indicator, of the appearance of the first tap, the appearance of the systolic murmur, the disappearance of the systolic murmur, the point at which the sound suddenly diminishes in intensity, and the point at which the sound ceases. These five points have been known as phases: first, second, third, fourth, and fifth phases respectively.

A good deal of confusion exists in the literature concerning the phases. This is due to the fact that some authors use the term phase to indicate the points at which the various changes in the character of the sounds occur, while other writers speak of the period between two of these points as a phase. Thus, the former writers call the point at which the first sound is heard the first phase; that at which the murmur appears the second phase; that at which the murmur disappears the third phase; that at which the sound following the murmur becomes suddenly of lessened intensity the fourth phase; and that at which the sound entirely disappears the fifth phase. On the other hand, the latter writers call the duration of the first clear sound, measured in millimetres of mercury, the first phase; the duration of the murmur the second phase; the duration of the second clear sound the third phase; and the duration of the dulled end sound the fourth phase. In order to avoid this confusion I would suggest that we adopt the word point to indicate the changes of sound and use the word phase exclusively in the latter sense.

Material.—I have been using the auscultatory method of determining blood-pressure as a routine procedure since May, 1910. I have taken 200 cases as they occurred during this period for the purpose

of this study. In all, 372 observations were made upon these 200 cases. Of these patients, 102 were males and 98 were females.

Ages.—Of the 200 patients, two were under 20 years of age; eleven were between 20 and 29 years of age; forty-four were between 30 and 39 years of age; thirty-two were between 40 and 49 years of age; fifty were between 50 and 59 years of age; thirty-seven were between 60 and 69 years of age, and ten were over 70 years of age. The ages of fourteen of the patients were not recorded. The youngest patient was a girl, aged 15 years. There were two patients aged 77 years; one was a male and the other a female. The following clinical diagnoses were made of the conditions from which these patients were suffering:

I. Normal cases, 5.

II. Cardiovascular diseases: (*a*) Fibroid myocarditis, 17; (*b*) parenchymatous myocarditis, 12; (*c*) mitral regurgitation, 16; (*d*) hypertrophy of the heart, 11; (*e*) dilation of the heart, 9; (*f*) fat heart, 6; (*g*) hypertrophy and dilation of the heart, 2; (*h*) tobacco heart, 2; (*i*) cardiac insufficiency, 1; (*j*) mitral obstruction and regurgitation, 1; (*k*) paroxysmal tachycardia, 1; (*l*) adherent pericardium, 1; (*m*) arteriosclerosis, 20.

III. Renal disease: Chronic nephritis, 6.

IV. Diseases of the respiratory system: (*a*) Consolidation of the apices, 3; (*b*) pulmonary emphysema, 5; (*c*) subacute bronchitis, 1; (*d*) bronchial asthma, 1.

V. Gastro-intestinal diseases: (*a*) Gastroptosis, 4; (*b*) gastrectasia, 7; (*c*) hypertrophic cirrhosis of the liver, 3; (*d*) atrophic cirrhosis of the liver, 1; (*e*) cholecystitis, 2; (*f*) carcinoma of the liver, 1; (*g*) carcinoma of the intestine, 2; (*h*) mucous colitis, 1; (*i*) chronic tonsillitis, 1.

VI. Nervous diseases: (*a*) Neurasthenia, 23; (*b*) hysteria, 2; (*c*) locomotor ataxia, 2; (*d*) general paresis, 1; (*e*) reflex vomiting, 1; (*f*) melancholia, 1.

VII. Diseases of metabolism: (*a*) Obesity, 8; (*b*) alcoholism, 9; (*c*) arthritis deformans, 2; (*d*) toxic arthritis, 1; (*e*) diabetes mellitus, 1.

VIII. Miscellaneous diseases: (*a*) Convalescent patients, 3; (*b*) acute articular rheumatism, 1; (*c*) prostatitis, 1; (*d*) hay fever, 1; (*e*) hyperthyroidism, 1.

In addition to this systematic study of 200 cases, other cases have been drawn upon to illustrate particular points as they have occurred in the discussion of the subject.

The observations were made in the recumbent posture. The Stanton sphygmomanometer was used in all cases except those marked *, in which the Tycos instrument was used, and those marked †, in which the Riva Rocci instrument was used. A 12-cm. cuff was employed.

II. THE METHOD OF PRODUCTION OF THE SOUNDS

The sounds are produced according to the laws governing the production of fluid veins. No sound is produced by a fluid flowing through a tube of uniform calibre. No sound is produced by a fluid flowing from a wider to a narrower tube, unless the latter has a lip projecting into the former tube. Neither the velocity of the flow of the fluid nor the smoothness or roughness of the wall of the tube has any influence on the production of sounds. When, however, a fluid flows from a narrower into a wider space a sound will be produced, and the characteristics of this sound will depend upon the velocity of the flow of the fluid and upon the relative size of the tubes (Mackenzie[17]).

It is conceivable that after the circulation in an arm has been shut off by the pressure of an inflatable cuff, the artery distal to the cuff is empty and relaxed, while the artery proximal to the cuff is full and presents its normal tone. When the pressure, being gradually reduced, reaches a point at which the force of the systole of the heart is able to push the blood into the distal portion of the vessel each pulsation produces a sound because the blood passes from a narrower into a wider space. When the distal portion of the vessel becomes partially filled the propulsion of more fluid into it sets up a fluid vein with the production of a murmur. Still later, as the equilibrium of the fluid becomes more nearly established on the proximal and the distal sides of the cuff, the murmur disappears and the tap first heard returns, to become suddenly dulled just before the complete circulatory balance is restored. The disappearance of the murmur and the reappearance of the original tap are perhaps the most difficult phenomena to account for. It would appear to be due to the absence of whorl production by the diminution of the constriction of the

vessel. Korotkow,[14] Ehret,[3] and Taussig and Cook[26] are of the opinion that the sound indicating the first phase is produced by the sudden distention of the empty artery distal to the cuff. The murmur, according to Taussig and Cook, is the result of whorls produced in the partially filled distal vessel. The reappearance of the tap they attribute to the failure of the formation of whorls in the blood, on account of the drop of pressure and the distention of a still empty distal vessel during diastole, by the systole of the heart. It is, however, more likely due to the disappearance of the whorls and to the fact that the blood is still flowing from a narrower into a wider tube. This is more likely, because in many cases no murmur is heard and the tap progressively diminishes from the time it is first heard till the fifth point is reached: the disappearance of all sounds. Taussig and Cook ascribe the muffling of the sound during the fourth phase to the buffer-like action of the blood in the partially filled distal vessel. But here again the relative size of the proximal and distal arteries, the two nearly approximating in calibre at this period, is ample to account for the phenomenon. Fischer[6] and Ettinger[4] ascribe the tones to the velocity of blood-flow through the artery. It seems, however, that during the minute necessary for an experienced observer to make an auscultatory blood-pressure observation the velocity of blood-flow is quite constant, and that this factor may be disregarded. Goodman and Howell[10] ascribe the third point, the clear tap heard after the disappearance of the murmur, to the condition of the vessel wall. They say "the more sclerotic the vessel wall and the greater the hypertrophy of the heart the more favorable are the conditions for the production of a clear tone." In the laws governing fluid veins we have seen that the character of the wall of the tube has no influence on the production of the sounds. The velocity of the blood has, however; so that, as between A and B, he with the stronger myocardium (normal or hypertrophied) will have the greater velocity of blood-flow than he with the weaker (degeneration or dilation). Goodman and Howell[10] state that the fourth point may be produced by a resilient vessel receiving a weakened shock. There is no need of looking for an explanation beyond the relative size of the tubes, the larger at this stage approaching the size of the smaller.

Bozowski[33] believes that the sounds originate in the heart and

are transmitted by the blood stream. Such a theory would fail entirely to account for the murmur phase. Furthermore, if the blood stream transmitted sounds generated in the heart one would always expect to hear the heart sounds in the peripheral vessels; such a phenomenon is rare. Gittings [9] calls attention to the fact that when the cuff is applied to the forearm the observer hears the sounds over the radial or ulnar artery exceptionally and for a short time only. He also records the fact that simple compression of the arm with an Esmarch bandage is not followed by sounds. He consequently considers the resonating character of the cuff of some importance. The conditions in the forearm are quite different from those in the arm. In the latter situation there is a single, large artery which, at the bend of the elbow, is quite superficial, and auscultation is done just below the point of compression. In the former there are two smaller arteries, both of which are running beneath large masses of muscle, only to become superficial just above the wrist. The arm is circular in outline, with a single bone; the forearm is elliptical with two bones. Uniform compression is obtainable in the former, impossible in the latter. The absence of sounds when compression is made with an Esmarch bandage may be accounted for by the impossibility of the gradual reduction of pressure that is permitted by an inflatable cuff.

Taussig and Cook [26] are of the opinion that in individuals with small brachial arteries the sounds are feeble. I am inclined to agree with this observation, although my records have not been kept in such a way that I can cite instances in substantiation of my belief.

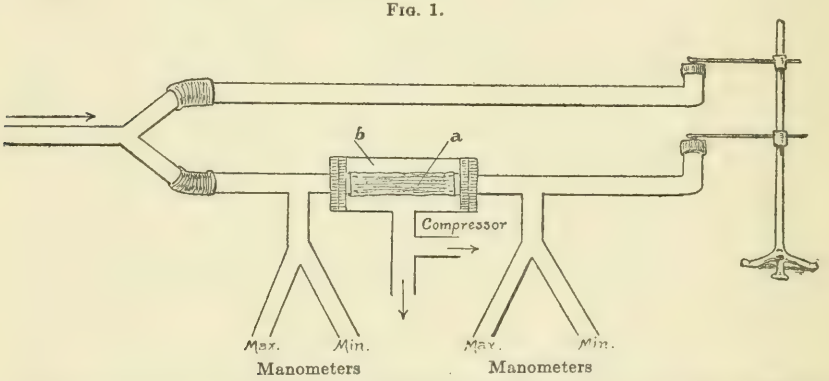
Schrumpf and Zabel [22] believe the tones to be due to the vibration of the arterial wall.

MacWilliam and Melvin,[18] in an endeavor to determine the diastolic blood-pressure in man, employed a pulsatile schema which is illustrated in Fig. 1. In the compression tube (*b*) they fastened a piece of artery (*a*) from one of the lower animals. The artery was surrounded by Ringer's fluid, which was also used as the perfusing fluid. Valved manometers were connected with the apparatus, as indicated in the figure. The external pressure around the artery in the compression tube was controlled by an Oliver's screw compressor. They first studied the oscillations produced in the artery under different pressures, and they found that the maximum oscilla-

tions were produced when the artery was flattened to a very considerable extent between the pulse beats,—*e.g.*, "to half-flattening in an easily distensible tube, to complete or nearly complete flattening in a non-distensible one."

They then studied the auscultatory method, using the same pulsatile schema. They could hear the characteristic sounds, when the phonendoscope was applied over the glass tubing, issuing from the artery in the compression tube. This fact controverts the idea that the artery distal to the compressed area is of importance in the production of the sounds. Since they heard characteristic sounds in the apparatus when the artery was surrounded by and filled with Ringer's fluid, the importance of the air in the cuff acting as a

FIG. 1.



The circulation schema of MacWilliam and Melvin (*Heart*, 1914, v 153). *a*, piece of artery of sheep, ox, horse, etc.; *b*, compression tube.

resonating medium in the production of the sounds is definitely disproved. They, however, attribute the sounds to the "vibration of the arterial wall when the normal circular form of the vessel is, in the compression area, more or less distorted by external pressure." They have in this pulsatile schema exactly the demonstration of the fact that the sounds are produced by the circulating fluid passing from a narrower (compressed artery) into a wider (glass) tube.

III. THE SIGNIFICANCE OF THE POINTS AND PHASES

The first point—the appearance of the first clear tapping sound—is acknowledged by all observers to indicate the systolic blood-pressure. Taussig and Cook [26] describe it as "the most accurate

way of determining this pressure. It is as much superior to the palpation of the radial as the sense of hearing is keener than the sense of touch." Warfield [29, 30] has proved that the first phase corresponds to the systolic blood-pressure by experiments on dogs.

The fourth point—the point at which the tap, which is heard after the disappearance of the murmur, suddenly becomes dull—is considered by Lang and Manswetowa,[16] Zabel,[32] Taussig and Cook,[26] Stone,[25] Hirschfelder,[12] and Warfield [29, 30] to indicate the diastolic pressure. The fifth point—the point of disappearance of all sounds—on the other hand, is considered to indicate the diastolic pressure by Korotkow,[14] Ettinger,[4] Gittings,[9] Goodman and Howell,[10, 11] Hooker and Southworth,[13] Krylow,[34] Fellner,[8] Fischer,[6, 7] Ehret,[3] Schrumpf and Zabel,[22] Moritz,[19] Sterzing,[24] Prendergast,[21] and Bickel.[1]

Bickel [1] found that the fourth point corresponded to the diastolic pressure obtained by the graphic method, and approximated the diastolic pressure as obtained by the palpatory method. The fifth point, however, corresponded to the diastolic pressure as obtained by the oscillatory method.

Zabel [32] made his observations in the reverse manner from that made by all other observers. He started with no pressure in the cuff and inflated it, at first rapidly and then more gradually, until the sound appeared, when he made his reading. He called that sound the fourth tone of Korotkow. As he increased the pressure in the cuff the point at which the tone became louder—third tone of Korotkow, according to his nomenclature—corresponded to the point of greatest oscillations of the v. Recklinghausen instrument and to the appearance of Ehret's phenomenon. There are important objections to making diastolic readings in this manner, the chief of which is that the noise made by inflating the cuff obscures the otherwise sharp fifth point.

Warfield's contention [29,30,31] that the fourth point corresponds to the diastolic pressure is supported by experiments on dogs. The animals were anæsthetized, and, after it was complete, the anæsthesia was continued by the intratracheal administration of ether. The right femoral artery of such an experimental animal was connected with a mercurial manometer, and a Dawson maximum and minimum pressure valve was introduced so that the diastolic pressure could be main-

tained. Pressure was then applied to the exposed right femoral artery by small cups, covered with rubber dam, which communicated with another mercury manometer. Both manometers were furnished with writing levers which recorded close to each other on a revolving drum. Warfield listened over the portion of the femoral artery, below the application of the pressure, with a stethoscope and recorded the occurrence of the various sounds on the revolving drum. As a result of studies on three dogs he found that the dull tone of the fourth point corresponded with the diastolic blood-pressure.

Hooker and Southworth,[13] on the other hand, recorded the sounds produced in the brachial artery, the pulse waves, and a falling mercury pressure on the same film. By this method they showed that the first point represented the systolic pressure, and the fifth point corresponded to the diastolic pressure.

Taussig and Cook [26] have checked their auscultatory readings by means of an Erlanger apparatus.

In clinical work one does not find that the conditions are as ideal as those found by Warfield in his experiments. The pressure of the cuff is applied to the brachial artery through intervening skin and muscle. Again, as will be seen in the chapter on absent points (page 186), the fourth point in clinical work is often absent. I believe, therefore, that for bedside work it would be better to record the fifth point as the diastolic pressure. I have so interpreted the fifth point in this study.

The contention that the interpretation of the diastolic pressure as indicated by the fourth point makes an important difference in determining mean pressures and pulse-pressures is quite well founded. I was under the impression that there was very little difference between the fourth point and the fifth point. On analyzing the observations recorded in Table I, however, I found that in the 118 observations in which both the fourth point and the fifth point were recorded the average difference amounted to fourteen millimetres. Variations above the average of fourteen millimetres were recorded nine times in cases of fibroid myocarditis, seven times in cases of parenchymatous myocarditis, five times in cases of arteriosclerosis, four times in cases of hypertrophy of the heart, three times in cases of neurasthenia, four times in cases of alcoholism, twice each in cases of

TABLE I

Auscultatory Blood-Pressure

No.	Sex	Age	First point	Second point	Third point	Fourth point	Fifth point	Diagnosis
1	F.	52	122	112	85	0	75	Hysteria.
2	M.	36	118	109	97	0	75	Mitral regurgitation.
			110	109	97	0	95	
3	M.	28	126	118	95	90	81	Normal.
4	F.	60	184	174	155	150	87	Fibroid myocarditis.
5	M.	52	130	126	104	96	86	Hypertrophy and dilation of the heart.
6	M.	46	118	105	90	72	65	Parenchymatous myocarditis.
			109	94	82	70	66	
			108	95	85	68	64	
			117	95	84	0	69	
7	M.	39	105	95	85	68	60	Dilation of the heart.
8	F.	58	188	178	168	95	90	Acute articular rheumatism.
9	M.	48	115	103	89	70	65	Parenchymatous myocarditis.
10	M.	36	0	157	140	95	90	Hypertrophic cirrhosis of the liver.
11	M.	51	133	120	108	105	95	Parenchymatous myocarditis.
			134	105	97	0	88	
12	F.	38	112	0	0	0	75	Neurasthenia.
13	F.	49	156	0	0	0	125	Cholecystitis.
			148	0	0	0	90	
14	M.	53	100	84	78	64	62	Parenchymatous myocarditis.
			100	95	82	0	64	
			102	0	0	0	68	
15	F.	26	108	102	79	0	64	Parenchymatous myocarditis.
			116	112	80	0	70	
			114	111	71	0	70	
			115	113	0	0	75	
			120	108	85	0	65	
			114	109	88	0	80	
			109	105	74	70	60	
			110	105	78	0	70	
			114	108	87	0	83	
			115	112	95	80	55	
			110	97	95	75	60	
			115	107	98	71	55	
			104	97	93	0	57	
			112	104	75	70	64	
			106	101	90	84	65	
			106	101	90	70	64	
			113	105	83	72	64	
			113	110	90	70	64	
			118	110	94	86	63	
			114	93	86	60	50	
			110	105	78	57	54	
			112	106	88	80	70	
			106	95	72	61	57	
			106	95	68	64	57	
			113	108	85	74	65	
			107	97	72	0	53	
			107	96	75	70	55	
			120	112	100	88	66	
			110	95	75	70	65	
			113	98	73	70	54	
			112	100	72	0	65	
16	F.	52	180	178	174	170	94	Arteriosclerosis.
			165	150	135	95	93	
			158	0	0	95	90	
			148	138	128	0	80	
17	M.	50	150	145	139	135	90	Hypertrophy of the heart.
			114	110	95	76	75	
			130	112	104	95	83	
18	M.	62	135	129	117	105	92	Fibroid myocarditis.
			139	125	118	0	86	
			140	135	112	109	103	
			157	141	135	0	93	
19	F.	51	200	0	0	110	95	Fibroid myocarditis.
20	F.	35	120	111	100	90	75	Neurasthenia.
			109	0	0	0	78	
21	M.	57	134	122	105	100	96	Dilation of the heart.
			134	124	112	110	100	
22	M.	45	159	148	132	125	100	Alcoholism.
23	F.	30	105	90	75	58	50	Neurasthenia.
			103	89	78	0	62	

TABLE I—*Continued*

No.	Sex	Age	First point	Second point	Third point	Fourth point	Fifth point	Diagnosis
24	M.	45	114	104	94	0	90	Normal.
			110	100	87	0	72	
25	M.	57	112	108	100	0	75	Arthritis deformans.
			120	115	104	0	78	
			0	118	105	0	102	
			124	110	95	0	74	
			125	116	109	0	80	
26	F.	53	160	152	144	0	78	Arteriosclerosis.
27	F.		120	110	95	0	70	Incomplete exophthalmic goitre.
28	M.	53	122	116	98	80	76	Convalescent from influenza.
29	M.	60	126	115	102	0	98	Parenchymatous myocarditis.
			94	86	70	0	63	
			123	113	98	0	75	
			112	104	90	0	75	
30	M.	32	136	128	112	0	98	Tobacco heart.
31	F.	53	98	90	80	0	72	Gastroptosis.
			120	0	0	0	90	
32	M.	32	132	120	97	68	64	Hypertrophic cirrhosis of the liver.
			122	105	95	85	70	
33	F.	51	105	98	88	0	80	Consolidation of right apex.
34	F.	46	144	134	120	0	115	Fat heart.
35	F.	44	105	0	0	75	70	Mitral regurgitation.
36	F.	60	115	0	0	0	86	Mucous colitis.
			170	0	0	0	100	
			170	155	145	0	130	
37	M.	19	94	82	71	0	68	Normal.
38	M.	70	129	126	105	0	80	Fibroid myocarditis.
			92	83	74	64	40	
			120	115	95	0	68	
39	M.	36	145	135	124	0	120	Chronic parenchymatous nephritis.
			144	125	115	0	105	
40	F.	60	129	125	110	105	90	Pulmonary emphysema.
41	F.	36	125	117	95	0	80	Neurasthenia.
42	M.	55	105	102	89	0	70	Fibroid myocarditis.
			105	97	80	0	74	
43	F.	15	115	0	0	0	56	Subacute bronchitis.
44	F.	58	140	128	110	104	75	Carcinoma of the liver.
45	M.	77	168	160	146	0	99	Chronic interstitial nephritis.
			136	130	120	115	80	
			149	145	142	0	88	
			135	120	105	90	83	
46	F.	61	164	145	130	0	69	Fat heart.
*47	M.	67	132	130	128	0	76	Fibroid myocarditis.
			130	124	115	0	66	
			136	128	120	116	82	
			150	138	124	0	88	
			144	130	122	0	82	
			134	130	122	0	84	
			144	138	130	88	74	
48	M.	36	120	110	100	0	80	Neurasthenia.
			114	105	90	0	72	
49	F.	45	128	0	0	0	80	Gastroptosis.
			120	0	0	0	75	
50	M.	67	184	0	0	0	95	Arteriosclerosis.
51	M.	64	0	149	126	88	80	Arteriosclerosis.
52	M.	35	125	120	113	0	75	Normal.
53	M.	58	180	174	160	150	80	Arteriosclerosis.
			135	120	102	0	80	
			128	124	115	0	103	
			135	127	102	0	80	
			140	125	98	0	68	
54	M.	37	128	114	99	0	93	General paresis.
55	F.	35	117	104	100	92	70	Reflex vomiting.
56	M.	42	193	182	140	0	100	Chronic nephritis.
57	F.	56	177	0	0	0	88	Mitral regurgitation.
			199	175	146	0	75	
58	M.	40	145	125	105	98	85	Alcoholism.
			124	114	95	90	68	
59	F.	47	186	0	0	0	103	Mitral regurgitation.
			173	0	0	0	105	
60	M.	52	135	130	127	0	85	Arteriosclerosis.
			124	120	104	0	90	
61	F.	38	122	112	104	96	89	Neurasthenia.

*This observation was made with the Tycos instrument.

TABLE I—*Continued*

No.	Sex	Age	First point	Second point	Third point	Fourth point	Fifth point	Diagnosis
62	F.	44	110	100	95	0	76	Gastrectasia.
			106	104	98	0	85	
63	F.	21	119	112	90	85	73	Obesity.
64	F.	53	0	125	113	0	85	Neurasthenia.
			124	115	100	0	94	
65	F.	37	150	135	122	0	88	Mitral regurgitation.
			125	118	104	0	75	
			130	119	110	104	82	
66	M.	42	130	0	0	0	82	Obesity.
			135	130	112	102	80	
67	M.	52	140	130	125	105	92	Normal.
68	M.	27	126	0	0	0	70	Neurasthenia.
			125	100	95	84	68	
			125	0	0	0	80	
69	F.	29	110	100	88	85	66	Neurasthenia.
70	F.	38	104	91	75	0	66	Gastrectasia.
71	F.	27	117	0	0	0	66	Parenchymatous myocarditis.
			111	0	0	0	65	
72	M.	76	180	170	160	0	105	Fibroid myocarditis.
73	M.	39	119	110	100	85	78	Parenchymatous myocarditis.
			128	100	92	0	78	
74	F.	27	128	113	94	0	80	Suspicious left apex.
75	F.	64	150	0	0	0	80	Arteriosclerosis.
			130	128	108	0	72	
76	M.	42	153	140	128	120	102	Obesity.
77	M.	68	95	89	73	0	50	Carcinoma of intestines.
			88	83	70	48	40	
78	M.	66	138	125	110	0	92	Mitral regurgitation.
79	M.		193	183	180	0	100	Alcoholism.
80	M.		135	126	109	104	80	Alcoholism.
81	M.		123	112	108	0	74	Chronic tonsillitis.
82	M.	36	128	0	0	0	80	Tobacco heart.
83	M.	54	190	178	160	0	119	Mitral regurgitation.
			193	188	162	130	125	
84	F.	49	139	130	120	82	75	Gastroptosis.
85	F.	52	184	0	0	0	102	Arteriosclerosis.
			184	168	154	0	95	
86	M.	50	0	129	122	0	80	Fibroid myocarditis.
87	M.	38	108	0	0	0	65	Parenchymatous myocarditis
88	F.	33	90	75	70	60	55	Gastrectasia.
			120	108	84	0	74	
			95	90	88	0	75	
89	M.	62	150	0	0	0	110	Hypertrophy of the heart.
			150	0	0	0	94	
			155	143	124	110	92	
90	F.	44	140	0	0	0	75	Gastrectasia.
91	F.	33	120	110	94	0	65	Gastroptosis.
92	F.	40	149	0	0	0	112	Mitral obstruction and mitral regurgitation.
			138	135	120	0	94	
93	F.	28	119	118	105	0	94	
			130	0	0	0	80	Toxic arthritis.
			104	84	75	0	65	
94	M.	26	112	105	85	0	80	Prostatitis.
95	M.	66	150	145	130	0	95	Arteriosclerosis.
			0	130	122	0	80	
96	F.	76	182	176	164	0	90	Pulmonary emphysema.
			182	171	160	92	82	
97	M.	65	225	0	0	0	104	Fat heart.
			205	195	165	0	85	
98	F.	55	128	111	105	80	75	Dilation of the heart.
			125	104	99	0	72	
99	F.	62	97	85	80	0	62	Carcinoma of the intestines.
100	M.	54	125	120	105	0	82	Paroxysmal tachycardia.
			136	135	120	0	104	
101	F.	31	0	165	160	0	88	Obesity.
102	M.	62	144	130	110	0	93	Melancholia.
103	M.	54	232	225	215	125	105	Locomotor ataxia.
104	F.	47	120	110	96	0	78	Cholecystitis.
*105	M.	65	144	142	136	0	92	Fibroid myocarditis.
			154	136	130	0	70	
			142	0	0	0	72	
			150	0	0	0	84	
			140	124	110	0	60	
			160	152	142	90	70	
			136	126	120	0	78	
			148	0	0	0	98	
			164	158	150	0	104	

*This observation was made with the Tycos instrument.

TABLE I—*Continued*

No.	Sex	Age	First point	Second point	Third point	Fourth point	Fifth point	Diagnosis
106	M.	48	0	130	110	0	80	Parenchymatous myocarditis.
107	M.	57	178	168	140	130	120	Fat heart.
108	M.	74	146	134	115	105	80	Arteriosclerosis.
109	M.	30	110	100	90	0	70	Neurasthenia.
110	M.	54	137	128	118	0	70	Dilation of the heart.
			124	115	92	80	60	
			118	104	95	0	60	
111	F.	30	110	0	0	0	85	Neurasthenia.
112	M.	53	180	166	145	135	105	Fibroid myocarditis.
			165	158	142	130	99	
113	M.	69	140	130	115	0	75	Hypertrophy and dilation of the heart.
			135	130	100	0	75	
114	F.	32	114	0	0	0	72	Gastrectasia.
115	M.	48	146	136	120	94	89	Alcoholism.
116	F.	35	120	0	0	0	80	Parenchymatous myocarditis.
117	M.	53	106	81	75	70	65	Dilation of the heart.
118	F.	68	193	185	174	0	85	Mitral regurgitation.
			210	190	160	85	79	
119	F.	65	125	121	111	0	95	Dilation of the heart.
120	F.	52	148	144	135	0	83	Fibroid myocarditis.
121	F.	48	130	0	0	0	78	Fat heart.
			125	114	105	0	90	
122	F.	34	120	110	105	0	82	Recovery from acute infection.
123	M.	51	112	103	86	0	84	Arteriosclerosis.
124	F.	48	144	133	124	115	89	Hypertrophy of the heart.
125	F.	61	178	160	155	0	90	Fibroid myocarditis.
			200	0	0	0	80	
126	M.	56	200	194	180	0	115	Alcoholism.
127	F.	37	95	0	0	0	65	Hypertrophic cirrhosis of the liver.
			105	0	0	0	68	
128	M.		180	175	154	140	130	Chronic nephritis.
129	F.	77	142	0	0	0	68	Hypertrophy of the heart.
130	F.	47	135	125	103	0	83	Hypertrophy of the heart.
131	F.	26	119	0	0	0	67	Neurasthenia.
			120	0	0	85	80	
132	F.	53	135	130	118	0	90	Arteriosclerosis.
133	F.	25	99	93	75	0	63	Neurasthenia.
134	F.	33	135	0	0	0	77	Suspicious left apex.
			125	112	100	0	85	
135	M.	71	145	132	115	0	70	Fibroid myocarditis.
			124	110	97	75	65	
136	F.	51	126	110	98	0	83	Parenchymatous myocarditis.
137	M.	54	107	103	93	0	60	Neurasthenia.
			109	0	0	0	78	
			125	120	110	0	75	
138	M.	47	120	119	105	0	84	Arthritis deformans.
139	M.	39	108	100	87	75	62	Neurasthenia.
			110	100	85	0	76	
140	M.	35	112	82	75	0	70	Dilation of the heart.
			102	89	85	0	70	
141	F.	65	145	0	0	0	72	Bronchial asthma.
142	F.	30	106	100	90	0	72	Neurasthenia.
143	F.	35	102	95	90	0	64	Neurasthenia.
144	F.	53	166	162	145	95	85	Fibroid myocarditis.
			160	154	142	130	88	
145	M.	43	135	120	102	72	60	Obesity.
146	F.	50	148	0	0	0	85	Obesity.
147	F.	68	170	0	0	0	95	Pulmonary emphysema.
148	F.	53	170	168	155	0	80	Pulmonary emphysema.
149	M.	39	116	105	89	80	70	Obesity.
150	M.	55	174	166	145	0	98	Fibroid myocarditis.
151	F.	71	162	146	130	0	76	Fibroid myocarditis.
			140	135	125	105	72	
152	F.	31	129	124	109	99	95	Hysteria.
153	M.	48	110	100	88	69	63	Diabetes mellitus.
154	F.	45	185	172	150	0	95	Postoperative convalescent.
			180	170	145	99	95	
155	F.	50	115	0	0	0	79	Mitral regurgitation.
			108	102	96	85	72	
156	M.	47	214	204	193	0	115	Arteriosclerosis.
			180	0	0	0	114	
157	F.		105	97	84	80	70	Pulmonary emphysema.
			114	98	92	78	70	
158	F.	60	170	155	135	0	88	Alcoholism.
			176	166	150	126	90	

TABLE I—*Continued*

No.	Sex	Age	First point	Second point	Third point	Fourth point	Fifth point	Diagnosis
159	F.	65	115	110	100	0	70	Mitral regurgitation.
160	M.	35	108	98	77	0	75	Neurasthenia.
			112	95	72	70	68	
161	M.	60	160	153	142	0	79	Arteriosclerosis.
			†170	168	160	0	84	
162	M.	47	146	139	120	0	85	Mitral regurgitation.
			135	124	115	85	82	
163	M.	57	141	120	115	0	64	Neurasthenia.
			137	0	0	0	65	
164	M.	48	154	134	118	92	84	Alcoholism.
165	M.	68	145	0	0	0	80	Hypertrophy of the heart.
			150	144	126	120	76	
166	F.		160	0	0	0	98	Arteriosclerosis.
			170	154	138	0	82	
167	F.	53	165	150	141	90	85	Hypertrophy of the heart.
			145	138	130	0	85	
168	M.	38	113	0	0	0	78	Gastrectasia.
169	F.	41	113	0	0	0	72	Neurasthenia.
170	F.	61	176	173	158	80	75	Arteriosclerosis.
			161	141	112	80	64	
171	M.	57	165	0	0	0	90	Atrophic cirrhosis of the liver.
172	M.	34	118	105	91	0	60	Neurasthenia.
173	M.	64	145	134	125	84	80	Hypertrophy of the heart.
174	F.	61	200	199	175	0	92	Arteriosclerosis.
175	F.	34	120	0	0	0	80	Mitral regurgitation.
			132	0	0	0	90	
176	M.	36	116	0	0	0	73	Cardiac insufficiency.
			115	0	0	0	75	
177	F.		114	0	0	0	75	Dilation of the heart.
			105	95	84	0	68	
*178	M.	64	178	170	158	0	110	Chronic nephritis.
			180	166	160	0	118	
			178	170	150	0	110	
			0	162	140	0	90	
			170	160	136	0	90	
			190	180	150	0	110	
			190	182	160	0	120	
179	M.	60	165	159	135	94	80	Arteriosclerosis.
180	F.	53	134	122	113	105	86	Arteriosclerosis.
			145	136	120	0	86	
181	F.	62	179	0	0	0	76	Mitral regurgitation.
			162	0	0	0	70	
			143	136	120	0	70	
			139	0	0	0	58	
182	F.	52	170	154	135	0	85	Fat heart.
			170	165	160	0	95	
183	M.	71	162	145	135	0	84	Fibroid myocarditis.
			168	162	145	0	90	
184	M.	60	144	125	112	70	62	Mitral regurgitation.
			144	122	115	0	68	
185	F.	70	140	135	125	0	70	Dilation of the heart.
			138	130	124	110	72	
186	M.	68	120	114	101	0	71	Mitral regurgitation.
			120	113	98	0	70	
187	M.	38	100	95	75	0	60	Alcoholism.
			110	85	84	0	56	
188	M.		148	140	103	0	95	Hypertrophy of the heart.
			154	150	140	0	104	
189	M.	51	170	164	153	0	110	Chronic nephritis.
			155	0	0	0	115	
190	M.	53	127	0	0	0	72	Hypertrophy of the heart.
			110	0	0	0	80	
191	F.		110	96	90	0	73	Neurasthenia.
192	M.	65	195	0	0	0	95	Obesity.
193	F.		190	0	0	0	100	Arteriosclerosis.
194	M.		120	114	101	0	75	Locomotor ataxia.
195	F.	39	115	110	94	0	78	Neurasthenia.
196	F.	50	115	100	87	0	72	Gastrectasia.
			117	92	80	0	74	
197	M.		210	0	0	0	116	Mitral regurgitation.
198	M.		96	90	72	0	66	Adherent pericardium.
			104	88	83	0	76	
199	F.	35	115	111	89	0	82	Hay fever.
200	F.	49	158	145	125	0	95	Hypertrophy of the heart.
			133	126	117	0	80	

* This observation was made with the Tycos instrument.
† This observation was made twenty minutes after the first observation, with a Riva Rocci instrument.

obesity and dilatation of the heart, and once each in cases of hypertrophic cirrhosis of the liver, pulmonary emphysema, carcinoma of the liver, chronic interstitial nephritis, mitral regurgitation, and locomotor ataxia. Warfield found that the difference between the fourth and fifth points in some cases amounted to twelve millimetres; in other cases the difference amounted only to from two to four millimetres (see Table II).

TABLE II

The Difference Between the Fourth Point and the Fifth Point

Fourth point, mm.	Fifth point, mm.	Difference, mm.	Fourth point, mm.	Fifth point, mm.	Difference, mm.	Fourth point, mm.	Fifth point, mm.	Difference, mm.
90	81	9	90	75	15	70	65	5
150	87	63	100	96	4	85	79	6
96	86	10	110	100	10	115	89	26
72	65	7	125	100	25	140	130	10
70	66	4	58	50	8	85	80	5
68	64	4	80	76	4	75	65	10
68	60	8	68	64	4	75	62	13
95	90	5	85	70	15	95	85	10
70	65	5	75	70	5	130	88	42
95	90	5	64	40	24	72	60	12
105	95	10	105	90	15	80	70	10
64	62	2	104	75	29	105	72	33
70	60	10	115	80	35	99	94	5
80	55	25	90	83	7	69	63	6
75	60	5	116	82	34	99	95	4
71	55	16	88	74	14	85	72	13
70	64	6	88	80	8	80	70	10
84	65	19	150	80	70	78	70	8
70	64	6	92	70	22	126	90	36
72	64	8	98	85	13	70	68	2
70	64	6	90	68	22	85	82	3
86	63	23	96	89	7	92	84	8
60	50	10	85	73	12	120	76	44
57	54	3	104	82	22	90	85	5
80	70	10	102	80	22	80	75	5
61	57	4	105	92	13	80	64	16
64	57	7	84	68	16	84	80	4
74	65	9	85	66	21	94	80	14
70	55	15	85	78	7	105	86	19
88	66	22	120	102	18	70	62	8
70	65	5	48	40	8	110	72	38
70	54	16	104	80	24	170	94	76
130	125	5	95	93	8	82	75	7
95	90	5	60	55	5	135	90	45
110	92	18	76	75	1	92	82	10
95	83	12	80	75	5	105	92	13
125	105	20	109	103	6	90	70	20
110	95	15	130	120	10	105	80	25
80	60	20	135	105	30	130	99	31
94	89	5						

Taussig and Cook,[26] Fischer,[6,7] Goodman and Howell,[10] Warfield,[30] Gittings,[9] Sterzing,[24] and Zabel [32] have observed that in cases of aortic regurgitation the fifth point is zero; that is, the sounds can be heard with no pressure in the cuff. Goodman and Howell [10] have considered a fifth point at zero pathognomonic of aortic regurgitation. On the other hand, Taussig and Cook [26] observed a fifth point at zero in one case of bronchopneumonia and in two cases of exophthalmic goitre. Fischer [6] has observed the same phenomenon in a case of high fever and in a case of cardiac neurosis. Zabel [32] has recorded it in some cases of arteriosclerosis. In eighteen cases of aortic regurgitation Taussig and Cook [26] recorded the fifth point above zero in ten, although in two of these cases it was occasionally recorded at zero.

In the present series of cases (Table I) there happens to be no case of aortic regurgitation; but from my other records I have taken the auscultatory blood-pressure observations of six cases diagnosticated aortic regurgitation by clinical methods (Table III).

TABLE III

Cases of Aortic Regurgitation

Case No.	Sex	Age	Observation	Fourth point	Fifth point
108	F.	63	1	Not obtainable	94
185	M.	24	1	60	56
257	M.	14	1	55	35
291	M.	50	1	62	20
			2	60	0
			3	48	40
			4	79	30*
363	M.	46	1	64	60
373	F.	44	1	40	20

* At this observation the fifth point in the right arm was 0.

In three other cases of aortic regurgitation, in which the fourth point was not recorded, the fifth point was zero but once out of six observations. In these nine cases the diagnosis was made from the existence of a diastolic murmur heard at the base of the heart and transmitted to the ensiform cartilage. I have records of a fifth point at zero in a case of hypertrophic cirrhosis of the liver and in a case of hyperthyroidism.

First Phase.—Fischer [6, 7] noted the fact that in cases of very high blood-pressure, such as accompany nephritis and tabes, the sounds of the first phase were abnormally loud. Tornai [27] believes that the

splitting of the tones of the first phase indicates dilation and hypertrophy of the heart.

Second Phase.—Fischer,[6, 7] Gittings,[9] and Goodman and Howell[11] have found the murmurs of the second phase usually very clear and the phase itself prolonged in cases of anæmia. The former author believes the absence of this phase indicates a slowing of the blood stream. Tornai[27] believes that a strong murmur phase, beginning at a high point, indicates a strong heart. He believes that when the second phase begins at a higher point and lasts longer after exercise we have a valuable indication of satisfactory reserve force in the left ventricle. If, on the other hand, the murmur phase disappears after physical exercise, we may conclude that there is heart weakness. In cases of dilation and hypertrophy of the heart the murmur does not begin nor does it end sharply, and murmurs of varying intensity are heard during the phase. The absence of this phase is indicative of heart weakness. Goodman and Howell[10] have observed that the second phase is the first to suffer in decompensation. The length of this phase they believe to be dependent upon cardiac effectiveness. Fischer[6] relies on a poor second phase to point either to aortic stenosis or to heart weakness. In a normal individual in whom Goodman and Howell[10] worked out the percentage of the pulse-pressure occupied by the various phases the second phase was the largest, 44.4 per cent. In a normal case in my own series (Case No. 3) the second phase formed 51.1 per cent. of the pulse-pressure (see page 139).

Third Phase.—The third phase is considered the most important by Fischer.[6] A long, loud, and clear third phase indicates cardiac strength; while a weak and short third phase with soft sounds indicates cardiac weakness (Fischer,[6] Warfield,[30] Ettinger,[4] Goodman and Howell[10]). In the normal case above referred to, Goodman and Howell found the third phase formed 11.1 per cent. of the pulse-pressure, and in the normal case in my own series (Case No. 3) it formed the same percentage (11.1) of the pulse-pressure.

Fourth Phase.—The fourth phase increases when there is cardiac weakness (Goodman and Howell[10]). Fischer[6] found that a long fourth phase almost always coincided with a low diastolic blood-pressure.

Goodman and Howell[10, 11] have made the most noteworthy con-

tributions to the significance of the phases. They worked out the percentage of the pulse-pressure that each phase formed, and, considering that the second and third phases were dependent upon cardiac strength or effectiveness, while the first and fourth phases were dependent upon cardiac weakness, they made a proportion to indicate the relative prominence of these two factors in a given case. In their first paper they found the pulse-pressure of a normal individual to be 45 mm. In this case the phases formed the following percentages of this pulse-pressure: First phase, 31.1 per cent.; second phase, 44.4 per cent.; third phase, 11.1 per cent.; fourth phase, 13.3 per cent. Therefore C. S. : C. W. :: 55.5 : 44.4.

I have analyzed the observations made on the two hundred cases already tabulated (see Table I) from this viewpoint. When one or more points are absent this equation obviously cannot be worked out.

I. Normal Cases

In five of the cases physical examination failed to reveal gross lesions of any of the organs: Cases 3, 24, 37, 52, and 67.

Case 3.—Male, aged 28 years. Pulse-pressure, 45. First phase, 17.7 per cent.; second phase, 51.1 per cent.; third phase, 11.1 per cent.; fourth phase, 20.0 per cent. C. S. : C. W. :: 62.2 : 37.7.

Case 24.—Male, aged 45 years. This patient had been under treatment about one year before the observations here recorded were made. At that time I was of the opinion that he was developing interstitial nephritis, because he was passing a large amount of urine, of low specific gravity, which showed occasional traces of albumin and a few casts. At the time of the present examination, however, the patient's urine was quite normal. The blood-pressure determinations showed the following results: First observation: Pulse-pressure, 24. First phase, 41.6 per cent.; second phase, 41.6 per cent.; third phase, fourth phase, 16.6 per cent.

Second observation, three months later: Pulse-pressure, 38. First phase, 26.3 per cent.; second phase, 34.2 per cent.; third phase, fourth phase, 39.4 per cent.

Case 37.—Male, aged 19 years. Pulse-pressure, 26. First phase, 46.1 per cent.; second phase, 42.3 per cent.; third phase, fourth phase, 11.5 per cent.

Case 52.—Female, aged 35 years. Pulse-pressure, 50. First phase, 10.0 per cent.; second phase, 14.0 per cent.; third phase, fourth phase, 76.0 per cent.

Case 67.—Male, aged 52 years. Pulse-pressure, 48. First phase, 20.8 per cent.; second phase, 10.4 per cent.; third phase, 20.8 per cent.; fourth phase, 27.0 per cent. C. S. : C. W. :: 31.2 : 47.8.

Six observations were made in these five cases. The fourth point was absent in four. At two observations it was possible to work

out the ratio of C. S. to C. W. In one of these C. S. was greater than C. W. (Case No. 3). This patient was a male, aged 28 years, who presented no symptoms. In the other, a male, aged 52 years, who also presented no symptoms, the C. S. was 31.2 and the C. W. 47.8. In this case, then, although physical examination could detect no gross lesions of the organs, the blood-pressure determinations enabled us to conclude that the circulation, functionally at least, was not normal.

II. Cardiovascular Diseases

(a) Fibroid Myocarditis:

There were seventeen cases of fibroid myocarditis: Cases 4, 18, 19, 38, 42, 47, 72, 86, 105, 112, 120, 125, 135, 144, 150, 151, and 183.

Case 4.—Female, aged 60 years. Pulse-pressure, 97. First phase, 10.3 per cent.; second phase, 19.5 per cent.; third phase, 5.1 per cent.; fourth phase, 64.9 per cent. C. S. : C. W. : : 24.6 : 75.2.

This observation was made after the patient had finished a course of carbonated brine baths.

Case 18.—Male, aged 62 years. First observation: Pulse-pressure, 43. First phase, 13.9 per cent.; second phase, 27.9 per cent.; third phase, 27.9 per cent.; fourth phase, 30.2 per cent. C. S. : C. W. : : 55.8 : 44.1.

Second observation, made at the end of the ninth bath in a series of eighteen carbonated brine baths: Pulse-pressure, 53. First phase, 26.4 per cent.; second phase, 13.2 per cent.; third phase, fourth phase, 60.3 per cent.

Third observation, made at the end of a series of carbonated brine baths: Pulse-pressure, 37. First phase, 13.5 per cent.; second phase, 62.1 per cent.; third phase, 8.1 per cent.; fourth phase, 16.2 per cent. C. S. : C. W. : : 70.2 : 29.7.

Fourth observation, made two weeks later: Pulse-pressure, 64. First phase, 25.0 per cent.; second phase, 9.3 per cent.; third phase, fourth phase, 65.6 per cent.

Case 19.—Female, aged 51 years. Pulse-pressure, 105. First phase, second phase, third phase, 85.7 per cent.; fourth phase, 14.2 per cent.

Case 38.—Male, aged 70 years. First observation, made at first examination: Pulse-pressure, 49. First phase, 6.1 per cent.; second phase, 42.8 per cent.; third phase, fourth phase, 51.0 per cent.

Second observation, made by an assistant at the first examination: Pulse-pressure, 52. First phase, 17.3 per cent.; second phase, 17.3 per cent.; third phase, 19.2 per cent.; fourth phase, 46.1 per cent. C. S. : C. W. : : 36.5 : 63.4.

Third examination, made after a course of carbonated brine baths: Pulse-pressure, 52. First phase, 9.6 per cent.; second phase, 38.4 per cent.; third phase, fourth phase, 51.9 per cent.

Case 42.—Male, aged 55 years. First observation: Pulse-pressure, 35. First phase, 8.5 per cent.; second phase, 37.1 per cent.; third phase, fourth phase, 64.2 per cent.

Second observation, made after rest and tonic treatment: Pulse-pressure, 31.

First phase, 25.8 per cent.; second phase, 54.5 per cent.; third phase, fourth phase, 19.3 per cent.

Case 47.*—Male, aged 67 years. First observation, February 5, 1912: Pulse-pressure, 56. First phase, 3.5 per cent.; second phase, 3.5 per cent.; third phase, fourth phase, 92.8 per cent.

Second observation, February 13, 1912, eight days later: Pulse-pressure, 64. First phase, 9.3 per cent.; second phase, 14.0 per cent.; third phase, fourth phase, 76.5 per cent.

Third observation, February 19, 1912, six days later: Pulse-pressure, 54. First phase, 14.8 per cent.; second phase, 14.8 per cent.; third phase, 7.4 per cent.; fourth phase, 62.9 per cent. C. S. : C. W. :: 22.2 : 77.7.

Fourth observation, February 29, 1912, ten days later, after leaving the hospital and taking a railway journey to his home, about fifty miles: Pulse-pressure, 62. First phase, 19.3 per cent.; second phase, 22.5 per cent.; third phase, fourth phase, 58.0 per cent.

Fifth observation, March 8, 1912, eight days later, just before an attack of bronchopneumonia: Pulse-pressure, 62. First phase, 22.5 per cent.; second phase, 12.9 per cent.; third phase, fourth phase, 64.5 per cent.

Sixth observation, March 13, 1912, six days later, after the bronchopneumonia had cleared up: Pulse-pressure, 50. First phase, 8.0 per cent.; second phase, 16.0 per cent.; third phase, fourth phase, 76.0 per cent.

Seventh observation, March 18, 1912, five days later. Patient uræmic. He had been taking digitalis for six days. Pulse-pressure, 70. First phase, 8.5 per cent.; second phase, 11.4 per cent.; third phase, 60.0 per cent.; fourth phase, 20.0 per cent. C. S. : C. W. :: 71.4 : 28.5.

The patient lived three weeks after this observation was made, but was at all times too ill to have his blood-pressure taken.

Case 72.—Male, aged 76 years. Pulse-pressure, 75. First phase, 13.3 per cent.; second phase, 13.3 per cent.; third phase, fourth phase, 73.3 per cent.

Case 86.—Male, aged 50 years. Pulse-pressure, 49. First phase, second phase, 14.2 per cent.; third phase, fourth phase, 85.7 per cent.

Case 105.*—Male, aged 65 years. First observation, February 19, 1912: Pulse-pressure, 52. First phase, 3.8 per cent.; second phase, 11.5 per cent.; third phase, fourth phase, 84.6 per cent.

Second observation, ten days later: Pulse-pressure, 84. First phase, 21.4 per cent.; second phase, 7.1 per cent.; third phase, fourth phase, 71.4 per cent.

Third observation, one week later: Pulse-pressure, 30. No phases.

Fourth observation, eleven days later: Pulse-pressure, 34. No phases.

Fifth observation, five weeks later: Pulse-pressure, 80. First phase, 20.0 per cent.; second phase, 17.5 per cent.; third phase, fourth phase, 62.5 per cent.

Sixth observation, two weeks later: Pulse-pressure, 90. First phase, 8.8 per cent.; second phase, 11.1 per cent.; third phase, 57.7 per cent.; fourth phase, 22.2 per cent. C.S. : C. W. :: 68.8 : 31.0.

Seventh observation, three weeks later: Pulse-pressure, 58. First phase, 17.2 per cent.; second phase, 10.3 per cent.; third phase, fourth phase, 72.4 per cent.

Eighth observation, four weeks later: Pulse-pressure, 50. No phases.

Ninth observation, seven weeks later. Pulse-pressure, 60. First phase, 10.0 per cent.; second phase, 13.3 per cent.; third phase, fourth phase, 76.6 per cent.

Case 112.—Male, aged 53 years. First observation: Pulse-pressure, 75. First phase, 18.6 per cent.; second phase, 28.0 per cent.; third phase, 13.3 per cent.; fourth phase, 40.0 per cent. C. S. : C. W. :: 41.3 : 58.6.

Second observation, three days later: Pulse-pressure, 66. First phase, 10.6 per cent.; second phase, 24.2 per cent.; third phase, 18.1 per cent.; fourth phase, 46.9 per cent. C. S. : C. W. :: 42.3 : 57.5.

Case 120.—Female, aged 52 years. Pulse-pressure, 65. First phase, 6.1 per cent.; second phase, 13.8 per cent.; third phase, fourth phase, 80.0 per cent.

Case 125.—Female, aged 61 years. First observation: Pulse-pressure, 88. First phase, 20.4 per cent.; second phase, 5.6 per cent.; third phase, fourth phase, 73.8 per cent.

Second observation, two months later: Pulse-pressure, 120. No phases.

Case 135.—Male, aged 71 years. First observation: Pulse-pressure, 75. First phase, 17.3 per cent.; second phase, 22.6 per cent.; third phase, fourth phase, 60.0 per cent.

Second observation, six weeks later: Pulse-pressure, 59. First phase, 23.7 per cent.; second phase, 22.0 per cent.; third phase, 37.2 per cent.; fourth phase, 16.9 per cent. C. S. : C. W. :: 59.2 : 40.6.

Case 144.—Female, aged 53 years. First observation: Pulse-pressure, 81. First phase, 4.9 per cent.; second phase, 20.9 per cent.; third phase, 61.7 per cent.; fourth phase, 12.3 per cent. C. S. : C. W. :: 82.6 : 17.2.

Second observation, six weeks later: Pulse-pressure, 72. First phase, 8.3 per cent.; second phase, 16.6 per cent.; third phase, 16.6 per cent.; fourth phase, 58.3 per cent. C. S. : C. W. :: 33.2 : 64.6.

Case 150.—Male, aged 55 years. Pulse-pressure, 76. First phase, 10.5 per cent.; second phase, 27.6 per cent.; third phase, fourth phase, 61.8 per cent.

Case 151.—Female, aged 71 years. First observation: Pulse-pressure, 86. First phase, 18.6 per cent.; second phase, 18.6 per cent.; third phase, fourth phase, 62.7 per cent.

Second observation, one month later: Pulse-pressure, 68. First phase, 7.3 per cent.; second phase, 14.7 per cent.; third phase, 29.4 per cent.; fourth phase, 48.5 per cent. C. S. : C. W. :: 44.1 : 55.8.

Case 183.—Male, aged 71 years. First observation: Pulse-pressure, 78. First phase, 21.8 per cent.; second phase, 12.8 per cent.; third phase, fourth phase, 65.3 per cent.

Second observation, six weeks later: Pulse-pressure, 78. First phase, 7.6 per cent.; second phase, 21.8 per cent.; third phase, fourth phase, 70.5 per cent.

Forty-three observations were made in these seventeen cases. The fourth point was absent at twenty-four of these observations; the second and third points were absent at one; the first and fourth points were absent at one; the second, third, and fourth points were absent at four. At thirteen observations it was possible to work the ratio of C. S. to C. W. At six the C. S. was less than the C. W. At seven the C. S. was greater than the C. W. In Case 18 the C. S. was greater than the C. W. at the first and the third observations; the first observation was made when the patient was first seen,

and the third at the conclusion of a course of treatment. At the latter observation the C. S. exceeded the C. W. by a greater margin than at the former. The second observation, made during the course of treatment, showed an absent fourth point. At the time of a fourth observation the fourth point was again absent. In Case 47 the C. S. was greater than the C. W. three weeks before death, after the exhibition of digitalis.

In Case 105 all points were present once in nine observations. At this observation, the sixth, C. S. was greater than C. W. The patient had extrasystoles, which had improved under treatment and subsequently disappeared, but which returned after an absence of three months.

In Case 135 the fourth point was absent at the time of the first observation; but at the time of the second observation, six weeks later, all points were present and C. S. was greater than C. W. This was accompanied by a marked improvement in the symptoms.

In Case 144 the C. S. was greater than the C. W. at the time of the first observation; but at the time of the second observation, six weeks later, the C. S. was less than the C. W., although symptomatically the patient was improved.

(*b*) *Parenchymatous Myocarditis:*

There were twelve cases of parenchymatous myocarditis: Cases 6, 9, 11, 14, 15, 29, 71, 73, 87, 106, 116, and 136.

Case 6.—Male, aged 46 years. First observation: Pulse-pressure, 53. First phase, 24.5 per cent.; second phase, 28.3 per cent.; third phase, 33.9 per cent.; fourth phase, 13.2 per cent. C. S. : C. W. :: 62.2 : 37.7.

Second observation, about three weeks later: Pulse-pressure, 43. First phase, 34.8 per cent.; second phase, 27.9 per cent.; third phase, 27.9 per cent.; fourth phase, 9.3 per cent. C. S. : C. W. :: 55.8 : 44.1.

Third observation, about three weeks later: Pulse-pressure, 44. First phase, 29.5 per cent.; second phase, 22.7 per cent.; third phase, 38.6 per cent.; fourth phase, 9.0 per cent. C. S. : C. W. :: 61.3 : 38.5.

Fourth observation, one week later: Pulse-pressure, 48. First phase, 45.8 per cent.; second phase, 22.9 per cent.; third phase, fourth phase, 31.2 per cent.

Case 9.—Male, aged 48 years. Pulse-pressure, 50. First phase, 24.0 per cent.; second phase, 28.0 per cent.; third phase, 38.0 per cent.; fourth phase, 10.0 per cent. C. S. : C. W. :: 66.0 : 34.0.

Case 11.—Male, aged 51 years. First observation: Pulse-pressure, 38. First phase, 34.2 per cent.; second phase, 31.5 per cent.; third phase, 7.8 per cent.; fourth phase, 26.3 per cent. C. S. : C. W. :: 39.3 : 60.5.

Second observation, eight weeks later: Pulse-pressure, 46. First phase,

63.0 per cent.; second phase, 17.3 per cent.; third phase, fourth phase, 19.5 per cent.

Case 14.—Male, aged 53 years. First observation: Pulse-pressure, 38. First phase, 42.1 per cent.; second phase, 15.7 per cent.; third phase, 36.8 per cent.; fourth phase, 5.2 per cent. C. S. : C. W. :: 52.5 : 47.3.

Second observation, five weeks later: Pulse-pressure, 36. First phase, 13.8 per cent.; second phase, 36.1 per cent.; third phase, fourth phase, 50.0 per cent.

Third observation, one month later, after neglect of treatment and other indiscretions: Pulse-pressure, 34. No phases.

Case 15.—Female, aged 26 years. First observation, made just before the thirteenth bath in a series of eighteen carbonated brine baths: Pulse-pressure, 44. First phase, 13.6 per cent.; second phase, 52.2 per cent.; third phase, fourth phase, 34.0 per cent.

Second observation, made immediately after the bath was given: Pulse-pressure, 46. First phase, 8.6 per cent.; second phase, 69.5 per cent.; third phase, fourth phase, 21.7 per cent.

Third observation, one hour later, after resting: Pulse-pressure, 44. First phase, 6.8 per cent.; second phase, 90.9 per cent.; third phase, fourth phase, 2.2 per cent.

Fourth observation, two days later, before the fourteenth bath: Pulse-pressure, 40. First phase, 5.0 per cent.; second phase, third phase, fourth phase, 95.0 per cent.

Fifth observation, immediately after the bath: Pulse-pressure, 55. First phase, 21.8 per cent.; second phase, 41.8 per cent.; third phase, fourth phase, 36.3 per cent.

Sixth observation, after one hour's rest: Pulse-pressure, 34. First phase, 14.7 per cent.; second phase, 61.7 per cent.; third phase, fourth phase, 23.5 per cent.

Seventh observation, two days later, before the fifteenth bath: Pulse-pressure, 49. First phase, 8.1 per cent.; second phase, 63.2 per cent.; third phase, 8.1 per cent.; fourth phase, 20.4 per cent. C. S. : C. W. :: 71.3 : 28.5.

Eighth observation, immediately after the bath: Pulse-pressure, 40. First phase, 12.5 per cent.; second phase, 67.5 per cent.; third phase, fourth phase, 20.0 per cent.

Ninth observation, after one hour's rest: Pulse-pressure, 31. First phase, 19.3 per cent.; second phase, 67.7 per cent.; third phase, fourth phase, 12.9 per cent.

Tenth observation, two days later, before the sixteenth bath: Pulse-pressure, 60. First phase, 5.0 per cent.; second phase, 28.3 per cent.; third phase, 8.3 per cent.; fourth phase, 41.6 per cent. C. S. : C. W. :: 36.9 : 46.6.

Eleventh observation, immediately after the bath: Pulse-pressure, 50. First phase, 26.0 per cent.; second phase, 4.0 per cent.; third phase, 40.0 per cent.; fourth phase, 30.0 per cent. C. S. : C. W. :: 44 : 56.

Twelfth observation, after one hour's rest: Pulse-pressure, 60. First phase, 13.3 per cent.; second phase, 15.0 per cent.; third phase, 45.0 per cent.; fourth phase, 26.6 per cent. C. S. : C. W. :: 60 : 39.9.

Thirteenth observation, two days later, before the seventeenth bath: Pulse-pressure, 47. First phase, 14.8 per cent.; second phase, 8.5 per cent.; third phase, fourth phase, 76.5 per cent.

Fourteenth observation, immediately after the bath: Pulse-pressure, 48. First

phase, 16.6 per cent.; second phase, 60.4 per cent.; third phase, 10.4 per cent.; fourth phase, 12.5 per cent. C. S. : C. W. :: 70.8 : 29.1.

Fifteenth observation, after one hour's rest: Pulse-pressure, 41. First phase, 12.1 per cent.; second phase, 26.8 per cent.; third phase, 14.6 per cent.; fourth phase, 46.3 per cent. C. S. : C. W. :: 41.4 : 58.4.

Sixteenth observation, two days later, before the eighteenth bath: Pulse-pressure, 42. First phase, 11.9 per cent.; second phase, 26.1 per cent.; third phase, 47.6 per cent.; fourth phase, 14.2 per cent. C. S. : C. W. :: 73.7 : 26.1.

Seventeenth observation, immediately after the bath: Pulse-pressure, 49. First phase, 16.3 per cent.; second phase, 44.8 per cent.; third phase, 22.4 per cent.; fourth phase, 16.3 per cent. C. S. : C. W. :: 67.2 : 32.6.

Eighteenth observation, after one hour's rest: Pulse-pressure, 49. First phase, 6.1 per cent.; second phase, 40.8 per cent.; third phase, 40.8 per cent.; fourth phase, 12.2 per cent. C. S. : C. W. :: 81.6 : 18.3.

Nineteenth observation, the next day: Pulse-pressure, 55. First phase, 14.5 per cent.; second phase, 29.0 per cent.; third phase, 14.5 per cent.; fourth phase, 41.8 per cent. C. S. : C. W. : : 43.5 : 56.3.

Twentieth observation, three weeks later, before the beginning of resistance exercises: Pulse-pressure, 64. First phase, 32.8 per cent.; second phase, 10.9 per cent.; third phase, 40.6 per cent.; fourth phase, 15.6 per cent. C. S. : C. W. :: 51.5 : 48.4.

Twenty-first observation, one week later, before the third set of resistance exercises: Pulse-pressure, 56. First phase, 8.9 per cent.; second phase, 48.2 per cent.; third phase, 37.5 per cent.; fourth phase, 5.3 per cent. C. S. : C. W. :: 85.7 : 14.2.

Twenty-second observation, immediately after the resistance exercises: Pulse-pressure, 42. First phase, 14.2 per cent.; second phase, 42.8 per cent.; third phase, 19.0 per cent.; fourth phase, 23.8 per cent. C. S. : C. W. :: 61.8 : 38.0.

Twenty-third observation, one week later, before the sixth set of resistance exercises: Pulse-pressure, 49. First phase, 22.4 per cent.; second phase, 46.9 per cent.; third phase, 22.4 per cent.; fourth phase, 8.1 per cent. C. S. : C. W. :: 69.3 : 30.5.

Twenty-fourth observation, immediately after the exercises: Pulse-pressure, 49. First phase, 22.4 per cent.; second phase, 55.1 per cent.; third phase, 8.1 per cent.; fourth phase, 14.2 per cent. C. S. : C. W. : : 63.2 : 36.6.

Twenty-fifth observation, after one hour's rest: Pulse-pressure, 48. First phase, 10.4 per cent.; second phase, 47.7 per cent.; third phase, 22.9 per cent.; fourth phase, 18.7 per cent. C. S. : C. W. :: 70.6 : 29.1.

Twenty-sixth observation, one week later, before the ninth set of resistance exercises: Pulse-pressure, 54. First phase, 18.5 per cent.; second phase, 46.2 per cent.; third phase, fourth phase, 35.1 per cent.

Twenty-seventh observation, immediately after the exercises: Pulse-pressure 52. First phase, 21.1 per cent.; second phase, 40.3 per cent.; third phase, 9.6 per cent.; fourth phase, 28.8 per cent. C. S. : C. W. :: 49.9 : 49.9.

Twenty-eighth observation, after one hour's rest: Pulse-pressure, 54. First phase, 14.8 per cent.; second phase, 22.2 per cent.; third phase, 22.2 per cent.; fourth phase, 40.7 per cent. C. S. : C. W. :: 44.4 : 55.5.

Twenty-ninth observation, one week later, before the twelfth set of resistance exercises: Pulse-pressure, 45. First phase, 33.3 per cent.; second phase, 44.4 per

cent.; third phase, 11.1 per cent.; fourth phase, 11.1 per cent. C. S. : C. W. :: 55.5 : 44.4.

Thirtieth observation, immediately after the exercises: Pulse-pressure, 59. First phase, 25.4 per cent.; second phase, 42.3 per cent.; third phase, 5.0 per cent.; fourth phase, 27.1 per cent. C. S. : C. W. :: 47.3 : 52.5.

Thirty-first observation, after one hour's rest: Pulse-pressure, 47. First phase, 25.5 per cent.; second phase, 59.5 per cent.; third phase, fourth phase, 14.8 per cent.

Case 29.—Male, aged 60 years. First observation: Pulse-pressure, 28. First phase, 39.2 per cent.; second phase, 46.4 per cent.; third phase, fourth phase, 14.2 per cent.

Second observation, one month later, after twelve electric light baths: Pulse-pressure, 31. First phase, 25.8 per cent.; second phase, 51.6 per cent.; third phase, fourth phase, 22.5 per cent.

Third observation, one month later: Pulse-pressure, 48. First phase, 20.8 per cent.; second phase, 31.2 per cent.; third phase, fourth phase, 47.9 per cent.

Fourth observation, three weeks later: Pulse-pressure, 37. First phase, 21.6 per cent.; second phase, 37.8 per cent.; third phase, fourth phase, 40.5 per cent.

Case 71.—Female, aged 27 years. First observation: Pulse-pressure, 41. No phases.

Second observation, six weeks later: Pulse-pressure, 46. No phases.

Case 73.—Male, aged 39 years. First observation: Pulse-pressure, 41. First phase, 21.9 per cent.; second phase, 24.3 per cent.; third phase, 36.5 per cent.; fourth phase, 17.0 per cent. C. S. : C. W. :: 60.8 : 38.9.

Second observation, six weeks later: Pulse-pressure, 50. First phase, 56.0 per cent.; second phase, 16.0 per cent.; third phase, fourth phase, 28.0 per cent.

Case 87.—Male, aged 38 years. Pulse-pressure, 43. No phases.

Case 106.—Male, aged 48 years. Pulse-pressure, 50. First phase, second phase, 40.0 per cent.; third phase, fourth phase, 60.0 per cent.

Case 116.—Female, aged 35 years. Pulse-pressure, 40. No phases.

Case 136.—Female, aged 51 years. Pulse-pressure, 43. First phase, 37.2 per cent.; second phase, 34.8 per cent.; third phase, fourth phase, 27.9 per cent.

Fifty-three observations were made in these twelve cases. The fourth point was absent at nineteen of these observations; the fourth and fifth points were absent at one; the first and fourth points were absent at one; and the second, third, and fourth points were absent at five.

At twenty-seven of these observations it was possible to work out the ratio of C. S. to C. W.; at nineteen the C. S. was greater than the C. W.; at seven the C. W. was greater than the C. S.; and at one the C. S. and the C. W. were equal.

Case 15 was a particularly favorable one for study. The patient was a female, aged 26 years, who had just recovered from an attack of diphtheria. About two years before the attack of diphtheria she

had had puerperal convulsions, which had left her heart muscle weak, and the attack of diphtheria still further weakened it. There was no valvulitis. The patient was first given a course of carbonated brine baths, and three weeks later was given a course of resistance exercises. During the progress of these courses of physiological treatments she attended to her customary household duties. At first the observations were made before and after each bath, and after the hour's rest which followed each bath. When the resistance exercises were begun the same observations were made in relation to the third, sixth, ninth, and twelfth treatments, once a week. The courses of treatments produced symptomatic benefit.

It will be noted that at first the fourth phase was absent at nearly every observation; later all the phases were usually present, and the C. S. = C. W. ratio could nearly always be worked out. C. S. was greater than C. W. at thirteen observations, less than C. W. at six observations, and the two were equal once.

(*c*) *Mitral Regurgitation:*

There were sixteen cases of mitral regurgitation: Cases 2, 35, 57, 59, 65, 78, 83, 118, 155, 159, 162, 175, 181, 184, 186, and 197.

Case 2.—Male, aged 36 years. First observation: Pulse-pressure, 43. First phase, 20.9 per cent.; second phase, 27.9 per cent.; third phase, fourth phase, 51.1 per cent.

Second observation, six weeks later: Pulse-pressure, 15. First phase, 6.6 per cent.; second phase, 80.0 per cent.; third phase, fourth phase, 13.3 per cent.

Case 35.—Female, aged 44 years. Pulse-pressure, 35. First phase, second phase, third phase, 85.7 per cent.; fourth phase, 14.2 per cent.

Case 57.—Female, aged 56 years. First observation: Pulse-pressure, 89. No phases.

Second observation, six weeks later: Pulse-pressure, 124. First phase, 19.3 per cent.; second phase, 23.3 per cent.; third phase, fourth phase, 57.2 per cent.

Case 59.—Female, aged 47 years. First observation: Pulse-pressure, 83. No phases.

Second observation, one month later: Pulse-pressure, 68. No phases.

Case 65.—Female, aged 37 years. First observation: Pulse-pressure, 62. First phase, 24.1 per cent.; second phase, 20.9 per cent.; third phase, fourth phase, 54.8 per cent.

Second observation, three weeks later: Pulse-pressure, 50. First phase, 14.0 per cent.; second phase, 28.0 per cent.; third phase, fourth phase, 58.0 per cent.

Third observation, three weeks later: Pulse-pressure, 48. First phase, 22.9 per cent.; second phase, 18.7 per cent.; third phase, 12.5 per cent.; fourth phase, 45.8 per cent. C. S. : C. W. :: 31.2 : 68.7.

Case 78.—Male, aged 66 years. Pulse-pressure, 46. First phase, 28.2 per cent.; second phase, 32.6 per cent.; third phase, fourth phase, 39.1 per cent.

Case 83.—Male, aged 54 years. First observation: Pulse-pressure, 71. First phase, 16.9 per cent.; second phase, 25.3 per cent.; third phase, fourth phase, 57.7 per cent.

Second observation, six weeks later: Pulse-pressure, 68. First phase, 7.3 per cent.; second phase, 38.2 per cent.; third phase, 47.0 per cent.; fourth phase, 7.3 per cent. C. S. : C. W. :: 85.2 : 14.6.

Case 118.—Female, aged 68 years. First observation: Pulse-pressure, 108. First phase, 7.4 per cent.; second phase, 10.1 per cent.; third phase, fourth phase, 82.4 per cent.

Second observation, six weeks later: Pulse-pressure, 131. First phase, 15.2 per cent.; second phase, 22.9 per cent.; third phase, 57.2 per cent.; fourth phase, 4.5 per cent. C. S. : C. W. :: 80.1 : 19.7.

Case 155.—Female, aged 50 years. First observation: Pulse-pressure, 36. No phases.

Second observation, six weeks later: Pulse-pressure, 36. First phase, 16.6 per cent.; second phase, 16.6 per cent.; third phase, 30.5 per cent.; fourth phase, 36.1 per cent. C. S. : C. W. :: 47.1 : 52.7.

Case 159.—Female, aged 65 years. Pulse-pressure, 45. First phase, 11.1 per cent.; second phase, 22.2 per cent.; third phase, fourth phase, 66.6 per cent.

Case 162.—Male, aged 47 years. First observation: Pulse-pressure, 61. First phase, 11.4 per cent.; second phase, 31.1 per cent.; third phase, fourth phase, 57.3 per cent.

Second observation, six weeks later: Pulse-pressure, 53. First phase, 20.7 per cent.; second phase, 16.9 per cent.; third phase, 56.6 per cent.; fourth phase, 5.6 per cent. C. S. : C. W. :: 73.5 : 26.3.

Case 175.—Female, aged 34 years. First observation: Pulse-pressure, 40. No phases.

Second observation, six weeks later: Pulse-pressure, 42. No phases.

Case 181.—Female, aged 62 years. First observation: Pulse-pressure, 103. No phases.

Second observation, two weeks later: Pulse-pressure, 92. No phases.

Third observation, fifteen days later: Pulse-pressure, 73. First phase, 9.5 per cent.; second phase, 21.9 per cent.; third phase, fourth phase, 68.4 per cent.

Fourth observation, two weeks later: Pulse-pressure, 81. No phases.

Case 184.—Male, aged 60 years. First observation. Pulse-pressure, 82. First phase, 23.1 per cent.; second phase, 15.8 per cent.; third phase, 51.2 per cent.; fourth phase, 9.7 per cent. C. S. : C. W. :: 67.0 : 32.8.

Second observation, six weeks later: Pulse-pressure, 76. First phase, 28.9 per cent.; second phase, 9.2 per cent.; third phase, fourth phase, 61.8 per cent.

Case 186.—Male, aged 68 years. First observation: Pulse-pressure, 49. First phase, 12.2 per cent.; second phase, 26.5 per cent.; third phase, fourth phase, 61.2 per cent.

Second observation, one month later: Pulse-pressure, 50. First phase, 14.0 per cent.; second phase, 30.0 per cent.; third phase, fourth phase, 56.0 per cent.

Case 197.—Male, age unrecorded. Pulse-pressure, 104. No phases.

Thirty-one observations were made in these sixteen cases. The fourth point was absent at fourteen of these observations; the second

and third points were absent at one; and the second, third, and fourth points were absent at ten. In six of these observations it was possible to work out the ratio of C. S. to C. W. At four of these the C. S. was greater than the C. W.; at two the C. W. was greater than the C. S.

Case 65 was that of a female, aged 37 years. When she first came under observation she had moderate loss of compensation; the fourth point was absent and the second phase formed 20.9 per cent. of the pulse-pressure. Three weeks later the fourth point was still absent, but the second phase formed 28.0 per cent. of the pulse-pressure. Three weeks later the fourth point was present, the second phase formed only 18.7 per cent. of the pulse-pressure, and the C. S. had the relation to the C. W. of 31.2 to 68.7. Symptomatically at this time the patient was improved, but her compensation was not definitely restored.

Case 83 was that of a male, aged 54 years. He had a marked loss of compensation with pronounced neurasthenic manifestations. At the first observation the fourth point was absent and the second phase formed 25.3 per cent. of the pulse-pressure. Six weeks later the fourth point was present; the second phase formed 38.2 per cent. of the pulse-pressure; the C. S. bore the relation to the C. W. of 85.2 to 14.6. There was a manifest compensatory hypertrophy. The patient died within the next twelve months.

Case 118 was that of a female, aged 68 years, who presented a moderate loss of compensation. At the first observation the fourth point was absent and the second phase formed only 10.1 per cent. of the pulse-pressure. Six weeks later, with well-marked symptomatic improvement, the fourth point was present; the second phase formed 22.9 per cent. of the pulse-pressure, and the C. S. bore the relation to the C. W. of 80.1 to 19.7.

Case 155 was that of a female, aged 50 years. At the first observation all the points were absent except the first and the fifth. Six weeks later all the points could be determined; the second phase formed 16.6 per cent. of the pulse-pressure, and C. S. had the relation to C. W. of 47.1 to 52.7.

Case 162 was that of a male, aged 47 years. At the first observation the fourth point was absent and the second phase formed 31.1 per cent. of the pulse-pressure. Six weeks later, with symptomatic

improvement, the fourth point was present; the second phase formed 16.9 per cent. of the pulse-pressure, and C. S. held the relation to C. W. of 73.5 to 26.3.

Case 184 was that of a male, aged 60 years. At the first observation all the points were present, the second phase formed 15.8 per cent. of the pulse-pressure, and the C. S. had the relation to the C. W. of 67 to 32.8. Six weeks later, with the symptoms about the same as they were at first, the fourth point was absent and the second phase formed 9.2 per cent. of the pulse-pressure.

(*d*) *Hypertrophy of the Heart:*

There were 11 cases of hypertrophy of the heart: Cases 17, 89, 124, 129, 130, 165, 167, 173, 188, 190, and 200.

Case 17.—Male, aged 50 years. First observation: Pulse-pressure, 60. First phase, 8.3 per cent.; second phase, 10.0 per cent.; third phase, 6.6 per cent.; fourth phase, 75.0 per cent. C. S. : C. W. :: 16.6 : 83.3.

Second observation, four weeks later: Pulse-pressure. 39. First phase, 10.2 per cent.; second phase, 38.4 per cent.; third phase, 48.7 per cent.; fourth phase, 2.5 per cent. C. S. : C. W. :: 87.1 : 12.7.

Third observation, four weeks later, after carbonated brine baths: Pulse-pressure, 47. First phase, 38.2 per cent.; second phase, 17.0 per cent.; third phase, 19.1 per cent.; fourth phase, 25.5 per cent. C. S. : C. W. :: 36.1 : 63.7.

Case 89.—Male, aged 62 years. First observation: Pulse-pressure, 40. No phases.

Second observation, two weeks later: Pulse-pressure, 56. No phases.

Third observation, four weeks later: Pulse-pressure, 63. First phase, 19.0 per cent.; second phase, 30.1 per cent.; third phase, 22.2 per cent.; fourth phase, 28.5 per cent. C. S. : C. W. :: 52.3 : 47.5.

Case 124.—Female, aged 48 years. Pulse-pressure, 55. First phase, 20.0 per cent.; second phase, 16.3 per cent.; third phase, 16.3 per cent.; fourth phase, 47.2 per cent. C. S. : C. W. :: 32.6 : 67.2.

Case 129.—Female, aged 77 years. Pulse-pressure, 74. No phases.

Case 130.—Female, aged 47 years. Pulse-pressure, 52. First phase, 19.2 per cent.; second phase, 42.3 per cent.; third phase, fourth phase, 38.4 per cent.

Case 165.—Male, aged 68 years. First observation: Pulse-pressure, 65. No phases.

Second observation, six weeks later: Pulse-pressure, 74. First phase, 8.1 per cent.; second phase, 24.3 per cent.; third phase, 8.2 per cent.; fourth phase, 59.4 per cent. C. S. : C. W. :: 32.4 : 67.5.

Case 167.—Female, aged 53 years. First observation: Pulse-pressure, 80. First phase, 18.7 per cent.; second phase, 11.2 per cent.; third phase, 63.7 per cent.; fourth phase, 6.2 per cent. C. S. : C. W. :: 74.9 : 24.9.

Second observation, six weeks later: Pulse-pressure, 60. First phase, 11.6 per cent.; second phase, 13.3 per cent.; third phase, fourth phase, 75.0 per cent.

Case 173.—Male, aged about 60 years. Pulse-pressure, 65. First phase, 16.9

per cent.; second phase, 13.8 per cent.; third phase, 63.0 per cent.; fourth phase, 6.1 per cent. C. S. : C. W. :: 76.8 : 23.0.

CASE 188.—Male, aged about 40 years. First observation: Pulse-pressure, 53. First phase, 15.0 per cent.; second phase, 69.8 per cent.; third phase, fourth phase, 15.0 per cent.

Second observation, six weeks later: Pulse-pressure, 50. First phase, 8.0 per cent.; second phase, 20.0 per cent.; third phase, fourth phase, 72.0 per cent.

CASE 190.—Male, aged about 55 years. First observation: Pulse-pressure, 55. No phases.

Second observation, six weeks later: Pulse-pressure, 30. No phases.

CASE 200.—Female, aged about 50 years. First observation: Pulse-pressure, 63. First phase, 20.6 per cent.; second phase, 31.7 per cent.; third phase, fourth phase, 47.6 per cent.

Second observation, four weeks later: Pulse-pressure, 53. First phase, 13.2 per cent.; second phase, 16.9 per cent.; third phase, fourth phase, 69.8 per cent.

Twenty observations were made on these eleven cases. The fourth point was absent at six observations, and the second, third, and fourth points were absent at six other observations. At eight observations it was possible to work out the C. S. = C. W. ratio. At four of these the C. S. was greater than the C. W.; at the other four the C. W. was greater than the C. S.

In Case 17, a male, aged 50 years, the C. W. was much in excess of the C. S. at the first observation. Four weeks later, after symptomatic improvement, the C. S. was greater than the C. W.; but after a second four weeks of symptomatic improvement the C. W. was in excess of the C. S., with apparently no unfavorable occurrence.

In Case 89, a male, aged 62 years, the first and the second observations showed absence of all points except the first and the fifth. Four weeks after the second observation, however, with decrease of weight and improvement in symptoms, all points could be determined, and C. S. was greater than C. W.

In Case 124, a female, aged 48 years, there were no symptoms. The cardiac hypertrophy was discovered in the course of a routine physical examination. The C. S. was less than the C. W.

In Case 165 the symptomatic improvement in the patient's condition was marked at the second observation. At the first observation the phases were absent; at the second all points could be determined, but the C. W. factor was greater than the C. S. factor.

In Case 167, a female, aged 53 years, who was convalescent from pneumonia, the C. S. was greater than the C. W. at the first examina-

tion; but at the second the fourth point was absent and the C. S. = C. W. ratio could not be worked out.

In Case 173, in which the C. S. was greater than the C. W., there were no evidences of cardiac failure.

(*e*) *Dilation of the Heart:*

There were nine cases of dilation of the heart: Cases 7, 21, 98, 110, 117, 119, 140, 177, and 185.

Case 7.—Male, aged 39 years. Pulse-pressure, 45. First phase, 22.2 per cent.; second phase, 22.2 per cent.; third phase, 37.7 per cent.; fourth phase, 17.7 per cent. C. S. : C. W. :: 59.9 : 39.9.

Case 21.—Male, aged 57 years. First observation: Pulse-pressure, 38. First phase, 31.5 per cent.; second phase, 44.7 per cent.; third phase, 13.1 per cent.; fourth phase, 10.5 per cent. C. S. : C. W. :: 57.8 : 41.0.

Second observation, two weeks later: Pulse-pressure, 34. First phase, 29.4 per cent.; second phase, 35.2 per cent.; third phase, 5.8 per cent.; fourth phase, 29.4 per cent. C. S. : C. W. :: 41.0 : 58.8.

Case 98.—Female, aged 55 years. First observation: Pulse-pressure, 53. First phase, 32.0 per cent.; second phase, 11.3 per cent.; third phase, 47.1 per cent.; fourth phase, 9.4 per cent. C. S. : C. W. :: 58.4 : 41.4.

Second observation, one month later: Pulse-pressure, 53. First phase, 39.6 per cent.; second phase, 9.4 per cent.; third phase, fourth phase, 50.9 per cent.

Case 110.—Male, aged 54 years. First observation: Pulse-pressure, 67. First phase, 13.4 per cent.; second phase, 14.9 per cent.; third phase, fourth phase, 71.6 per cent.

Second observation, one month later: Pulse-pressure, 64. First phase, 14.0 per cent.; second phase, 35.9 per cent.; third phase, 18.7 per cent.; fourth phase, 31.2 per cent. C. S. : C. W. :: 54.6 : 45.2.

Third observation, two weeks later: Pulse-pressure, 58. First phase, 24.0 per cent.; second phase, 15.5 per cent.; third phase, fourth phase, 60.3 per cent.

Case 117.—Male, aged 53 years. Pulse-pressure, 41. First phase, 60.9 per cent.; second phase, 14.6 per cent.; third phase, 12.1 per cent.; fourth phase, 12.1 per cent. C. S. : C. W. :: 26.7 : 73.

Case 119.—Female, aged about 60 years. Pulse-pressure, 30. First phase, 13.3 per cent.; second phase, 33.3 per cent.; third phase, fourth phase, 53.3 per cent.

Case 140.—Male, aged 35 years. First observation: Pulse-pressure, 42. First phase, 71.4 per cent.; second phase, 16.6 per cent.; third phase, fourth phase, 11.9 per cent.

Second observation, six weeks later: Pulse-pressure, 32. First phase, 40.6 per cent.; second phase, 12.5 per cent.; third phase, fourth phase, 46.8 per cent.

Case 177.—Female, aged about 35 years. First observation: Pulse-pressure, 39. No phases.

Second observation, six weeks later: Pulse-pressure, 37. First phase, 27.0 per cent.; second phase, 29.7 per cent.; third phase, fourth phase, 43.2 per cent.

Case 185.—Female, aged about 70 years. First observation: Pulse-pressure,

70. First phase, 7.1 per cent.; second phase, 14.2 per cent.; third phase, fourth phase, 78.5 per cent.

Second observation, six weeks later: Pulse-pressure, 66. First phase, 12.1 per cent.; second phase, 9.0 per cent.; third phase, 21.2 per cent.; fourth phase, 57.5 per cent. C. S. : C. W. :: 30.2 : 69.6.

Sixteen observations were made in these nine cases. The fourth point was absent at eight, and all points except the first and the fifth were absent at one. The C. S. = C. W. ratio could be determined in seven instances; in four the C. S. was greater than the C. W.; in three the C. W. was greater than the C. S.

Case 7 was that of a neurasthenic with a moderately dilated heart. The C. S. = C. W. ratio was quite normal.

Case 21 was that of a male, aged 57 years, in whom dilation had followed unusual exertion. After a short course of treatment, which was discontinued against advice, the C. S. factor, which had been greater, became less than the C. W. factor.

In Case 98 the change from a C. S. factor in excess of the C. W. factor to a condition in which the fourth point was absent occurred during treatment. There was little symptomatic evidence of cardiac weakness, however.

In Case 110 the opposite change was seen. At first the fourth point was absent; but after one month's treatment all points could be detected, and the C. S. factor was greater than the C. W. factor. But two weeks later the conditions noted at the first observation were seen.

Case 117 showed marked symptoms of cardiac failure and a C. W. factor greatly in excess of the C. S. factor.

In Case 185 the change from an absent fourth point to a ratio of C. S. : C. W. :: 30.2 : 69.6 was attended with increase of symptoms: insomnia, indigestion, weakness, and nervousness.

(*f*) *Fat Heart:*

There were six cases of fat heart: Cases 34, 46, 97, 107, 121, and 182.

Case 34.—Female, aged 46 years. Pulse-pressure, 29. First phase, 34.4 per cent.; second phase, 48.2 per cent.; third phase, fourth phase, 17.2 per cent.

Case 46.—Female, aged 61 years. Pulse-pressure, 95. First phase, 20 per cent.; second phase, 15.7 per cent.; third phase, fourth phase, 64.2 per cent.

Case 97.—Male, aged 65 years. First observation: Pulse-pressure, 121. No phases.

Second observation, six weeks later: Pulse-pressure, 120. First phase, 8.3 per cent.; second phase, 25.0 per cent.; third phase, fourth phase, 66.6 per cent.

Case 107.—Male, aged 57 years. Pulse-pressure, 58. First phase, 17.2 per cent.; second phase, 48.2 per cent.; third phase, 17.2 per cent.; fourth phase, 17.2 per cent. C. S. : C. W. :: 65.4 : 34.4.

Case 121.—Female, aged 48 years. First observation: Pulse-pressure, 52. No phases.

Second observation, six weeks later: Pulse-pressure, 35. First phase, 31.4 per cent.; second phase, 25.7 per cent.; third phase, fourth phase, 42.8 per cent.

Case 182.—Female, aged 52 years. First observation: Pulse-pressure, 85. First phase, 18.8 per cent.; second phase, 22.3 per cent.; third phase, fourth phase, 58.8 per cent.

Second observation, six weeks later: Pulse-pressure, 75. First phase, 6.6 per cent.; second phase, 6.6 per cent.; third phase, fourth phase, 86.6 per cent.

Nine observations were made in these six cases of fat heart. The fourth point was absent at six observations; the second, third, and fourth points were absent at two. At only one observation could the C. S. = C. W. ratio be determined. In that case the C. S. factor was greater than the C. W. factor. The patient was not complaining of symptoms referable to the heart.

(*g*) *Hypertrophy and Dilation of the Heart:*

There were two cases of hypertrophy and dilation of the heart: Cases 5 and 113.

Case 5.—Male, aged about 50 years. Pulse-pressure, 44. First phase, 9.0 per cent.; second phase, 50.0 per cent.; third phase, 18.1 per cent.; fourth phase, 22.7 per cent. C. S. : C. W. :: 68.1 : 31.7.

Case 113.—Male, aged 69 years. First observation: Pulse-pressure, 65. First phase, 15.3 per cent.; second phase, 23.0 per cent.; third phase, fourth phase, 61.5 per cent.

Second observation, six weeks later: Pulse-pressure, 60. First phase, 8.3 per cent.; second phase, 50.0 per cent.; third phase, fourth phase, 41.6 per cent.

In the two cases of hypertrophy and dilation of the heart the fourth point was absent at both observations made in one of the cases. In the other case all the points were present. and the C. S. factor was in excess of the C. W. factor.

(*h*) *Tobacco Heart:*

There were two cases of tobacco heart: Cases 30 and 82.

Case 30.—Male, aged 32 years. Pulse-pressure, 38. First phase, 21.0 per cent.; second phase, 42.1 per cent.; third phase, fourth phase, 36.8 per cent.

Case 82.—Male, aged 36 years. Pulse-pressure, 48. No phases.

In the two cases of tobacco heart the fourth point was absent at one and the second, third, and fourth points were absent at the other.

(*i*) *Cardiac Insufficiency:*

Case 176 was a case of cardiac insufficiency. Male, aged about 35 years.

First observation: Pulse-pressure, 43. No phases.
Second observation, one month later: Pulse-pressure, 40. No phases.

In the case of cardiac insufficiency, diagnosticated on account of some obscure symptoms which might be referred to a weakness of the cardiac muscle, following a previously well-marked dilation from which the patient had about recovered, all the points were absent, except the first and fifth, at two observations made at intervals of one month.

(*j*) *Mitral Obstruction and Regurgitation:*

Case 92 was a case of mitral obstruction and regurgitation. Female, aged 40 years.

First observation: Pulse-pressure, 37. No phases.
Second observation, three weeks later: Pulse-pressure, 44. First phase, 6.8 per cent.; second phase, 34.0 per cent.; third phase, fourth phase, 59.0 per cent.
Third observation, three weeks later: Pulse-pressure, 25. First phase, 4.0 per cent.; second phase, 52.0 per cent.; third phase, fourth phase, 44.0 per cent.

In the case of mitral obstruction and regurgitation three observations were made. At the first observation the second, third, and fourth points were absent. At the second and third observations the fourth point was absent. The second phase in this case increased with symptomatic improvement from 34 per cent. at the second observation to 52 per cent. at the third observation.

(*k*) *Paroxysmal Tachycardia:*

Case 100 was a case of paroxysmal tachycardia. Male, aged about 50 years.

First observation: Pulse-pressure, 43. First phase, 11.6 per cent.; second phase, 34.8 per cent.; third phase, fourth phase, 53.4 per cent.
Second observation, five weeks later: Pulse-pressure, 32. First phase, 3.1 per cent.; second phase, 46.8 per cent.; third phase, fourth phase, 50.0 per cent.

In the case of paroxysmal tachycardia the fourth point was absent at both observations, made at an interval of five weeks.

(*l*) *Adherent Pericardium:*

Case 198 was a case of adherent pericardium. Male, aged about 55 years.

First observation: Pulse-pressure, 30. First phase, 20.0 per cent.; second phase, 60.0 per cent.; third phase, fourth phase, 20.0 per cent.

Second observation, six days later: Pulse-pressure, 28. First phase, 57.1 per cent.; second phase, 17.8 per cent.; third phase, fourth phase, 25.0 per cent.

In the case of adherent pericardium the fourth point was absent at both observations, made at an interval of six days.

(*m*) *Arteriosclerosis:*

There were twenty cases of arteriosclerosis: Cases 16, 26, 50, 51, 53, 60, 75, 85, 95, 108, 123, 132, 156, 161, 166, 170, 174, 179, 180, and 193.

Case 16.—Female, aged 52 years. First observation: Pulse-pressure, 86. First phase, 2.3 per cent.; second phase, 4.6 per cent.; third phase, 4.6 per cent.; fourth phase, 88.3 per cent. C. S. : C. W. :: 9.2 : 90.6.

Second observation, one month later: Pulse-pressure, 72. First phase, 20.8 per cent.; second phase, 20.8 per cent.; third phase, 55.5 per cent.; fourth phase, 2.7 per cent. C. S. : C. W. :: 76.3 : 23.5.

Third observation, two weeks later: Pulse-pressure, 68. First phase, second phase, third phase, 92.6 per cent.; fourth phase, 7.3 per cent.

Fourth observation, one month later: Pulse-pressure, 68. First phase, 14.7 per cent.; second phase, 14.7 per cent.; third phase, fourth phase, 70.5 per cent.

Case 26.—Female, aged 53 years. Pulse-pressure, 82. First phase, 9.7 per cent.; second phase, 9.7 per cent.; third phase, fourth phase, 80.4 per cent.

Case 50.—Male, aged 67 years. Pulse-pressure, 89. No phases.

Case 51.—Male, aged 64 years. Pulse-pressure, 69. First phase, second phase, 33.3 per cent.; third phase, 55.0 per cent.; fourth phase, 11.5 per cent.

Case 53.—Male, aged 58 years. First observation: Pulse-pressure, 100. First phase, 6.0 per cent.; second phase, 14.0 per cent.; third phase, 10.0 per cent.; fourth phase, 70.0 per cent. C. S. : C. W. :: 24 : 76.

Second observation, two weeks later: Pulse-pressure, 55. First phase, 27.2 per cent.; second phase, 32.7 per cent.; third phase, fourth phase, 40.0 per cent.

Third observation, two days later: Pulse-pressure, 25. First phase, 16.0 per cent.; second phase, 36.0 per cent.; third phase, fourth phase, 48.0 per cent.

Fourth observation, one week later: Pulse-pressure, 55. First phase, 14.5 per cent.; second phase, 45.4 per cent.; third phase, fourth phase, 40.0 per cent.

Fifth observation, two weeks later: Pulse-pressure, 72. First phase, 20.8 per cent.; second phase, 37.5 per cent.; third phase, fourth phase, 41.6 per cent.

Case 60.—Male, aged 52 years. First observation: Pulse-pressure, 50. First phase, 10.0 per cent.; second phase, 6.0 per cent.; third phase, fourth phase, 84.0 per cent.

Second observation, two weeks later: Pulse-pressure, 34. First phase, 11.7 per cent.; second phase, 47.0 per cent.; third phase, fourth phase, 41.1 per cent.

CASE 75.—Female, aged 64 years. First observation: Pulse-pressure, 70. No phases.

Second observation, one month later: Pulse-pressure, 58. First phase, 3.4 per cent.; second phase, 34.4 per cent.; third phase, fourth phase, 62.0 per cent.

CASE 85.—Female, aged 52 years. First observation: Pulse-pressure, 82. No phases.

Second observation, six weeks later: Pulse-pressure, 89. First phase, 17.9 per cent.; second phase, 15.6 per cent.; third phase, fourth phase, 66.2 per cent.

CASE 95.—Female, aged 66 years. First observation: Pulse-pressure, 55. First phase, 9.0 per cent.; second phase, 27.2 per cent.; third phase, fourth phase, 63.6 per cent.

Second observation, two months later: Pulse-pressure, 50. First phase, second phase, 16.0 per cent.; third phase, fourth phase, 84.0 per cent.

CASE 108.—Male, aged 74 years. Pulse-pressure, 66. First phase, 18.1 per cent.; second phase, 28.7 per cent.; third phase, 15.1 per cent.; fourth phase, 37.8 per cent. C. S. : C. W. :: 43.8 : 55.9.

CASE 123.—Male, aged 51 years. Pulse-pressure, 28. First phase, 32.1 per cent.; second phase, 60.7 per cent.; third phase, fourth phase, 7.1 per cent.

CASE 132.—Male, aged 53 years. Pulse-pressure, 45. First phase, 11.1 per cent.; second phase, 26.6 per cent.; third phase, fourth phase, 62.2 per cent.

CASE 156.—Male, aged 47 years. First observation: Pulse-pressure, 99. First phase, 10.1 per cent.; second phase, 11.1 per cent.; third phase, fourth phase, 78.7 per cent.

Second observation, six weeks later: Pulse-pressure, 66. No phases.

CASE 161.—Male, aged 60 years. First observation: Pulse-pressure, 81. First phase, 8.6 per cent.; second phase, 12.3 per cent.; third phase, fourth phase, 77.7 per cent.

Second observation, eighteen months later: Pulse-pressure, 86. First phase, 2.3 per cent.; second phase, 9.3 per cent.; third phase, fourth phase, 88.3 per cent.

CASE 166.—Female, aged about 68 years. First observation: Pulse-pressure, 62. No phases.

Second observation, six weeks later: Pulse-pressure, 88. First phase, 18.1 per cent.; second phase, 18.1 per cent.; third phase, fourth phase, 63.6 per cent.

CASE 170.—Female, aged 61 years. First observation: Pulse-pressure, 101. First phase, 28.4 per cent.; second phase, 14.8 per cent.; third phase, 77.2 per cent.; fourth phase, 4.9 per cent. C. S. : C. W. :: 92.0 : 7.8.

Second observation, six weeks later: Pulse-pressure, 97. First phase, 20.6 per cent.; second phase, 29.8 per cent.; third phase, 32.9 per cent.; fourth phase, 16.7 per cent. C. S. : C. W. :: 62.7 : 37.3.

CASE 174.—Female, aged 61 years. Pulse-pressure, 108. First phase, 0.9 per cent.; second phase, 22.2 per cent.; third phase, fourth phase, 76.8 per cent.

CASE 179.—Male, aged about 60 years. Pulse-pressure, 85. First phase, 7.0 per cent.; second phase, 28.2 per cent.; third phase, 48.4 per cent.; fourth phase, 16.4 per cent. C. S. : C. W. :: 76.6 : 23.4.

CASE 180.—Female, aged 53 years. First observation: Pulse-pressure, 48. First phase, 25.0 per cent.; second phase, 18.7 per cent.; third phase, 16.6 per cent.; fourth phase, 39.5 per cent. C. S. : C. W. :: 35.3 : 64.5.

Second observation, twelve days later: Pulse-pressure, 59. First phase, 15.2 per cent.; second phase, 27.2 per cent.; third phase, fourth phase, 57.6 per cent.

CASE 193.—Female, aged about 60 years. Pulse-pressure, 90. No phases.

Thirty-six observations were made in these twenty cases. The first point was absent once. The first point and the fourth points were absent once. The second and third points were absent once. The fourth point was absent nineteen times. The second, third, and fourth points were absent six times. The C. S. = C. W. ratio could be worked out in eight cases; in four the C. S. factor was greater than the C. W. factor, and in the other four the C. S. factor was less than the C. W. factor.

In Case 16 the change from C. S. : C. W. :: 9.2 : 90.6 to C. S. : C.W. :: 76.3 : 23.5 was accompanied by particularly well-marked symptomatic improvement; but after an increase in the symptoms, due to mental anxiety and a dietary indiscretion, the relation was disturbed, and once the second and third points were absent, and on another occasion the fourth point was absent.

In Case 53 the patient, while under treatment, improved in some respects; he had been indulging too freely in alcohol, and this factor was eliminated; but his circulatory condition did not alter greatly. Eighteen months or so after the last observation was made he had an attack of hemiplegia.

In Case 156 the change from an absent fourth point at the first observation to an absence of all points except the first and fifth occurred in spite of symptomatic improvement. This patient was seen again a year later. At that time he was in good physical and mental condition and his blood-pressure observations showed an absent fourth point on several occasions.

In Case 180 there was almost no change in the symptoms at the time of the second examination.

III. Renal Diseases

Chronic Nephritis:

There were six cases of chronic nephritis: Cases 39, 45, 56, 128, 178, and 189.

CASE 39.—Male, aged 36 years. First observation: Pulse-pressure, 25. First phase, 40.0 per cent.; second phase, 44.0 per cent.; third phase, fourth phase, 16.0 per cent.

Second observation, two months later: Pulse-pressure, 39. First phase, 48.7 per cent.; second phase, 25.6 per cent.; third phase, fourth phase, 25.6 per cent.

Case 45.—Male, aged 77 years. First observation: Pulse-pressure, 69. First phase, 11.5 per cent.; second phase, 20.2 per cent.; third phase, fourth phase, 68.1 per cent.

Second observation, one month later: Pulse-pressure, 56. First phase, 10.7 per cent.; second phase, 17.8 per cent.; third phase, 8.9 per cent.; fourth phase, 62.5 per cent. C. S. : C. W. :: 26.7 : 73.2.

Third observation, six weeks later: Pulse-pressure, 61. First phase, 6.5 per cent.; second phase, 4.9 per cent.; third phase, fourth phase, 88.5 per cent.

Fourth observation, one month later: Pulse-pressure, 52. First phase, 28.8 per cent.; second phase, 28.8 per cent.; third phase, 28.8 per cent.; fourth phase, 13.4 per cent. C. S. : C. W. :: 57.6 : 42.2.

Case 56.—Male, aged about 35 years. Pulse-pressure, 93. First phase, 11.8 per cent.; second phase, 45.1 per cent.; third phase, fourth phase, 43.0 per cent.

Case 128.—Male, aged about 70 years. Pulse-pressure, 50. First phase, 10.0 per cent.; second phase, 42.0 per cent.; third phase, 28.0 per cent.; fourth phase, 20.0 per cent. C. S. : C. W. :: 70 : 30.

Case 178.*—Male, aged 64 years. First observation: Pulse-pressure, 68. First phase, 11.7 per cent.; second phase, 17.6 per cent.; third phase, fourth phase, 70.5 per cent.

Second observation, the next day: Pulse-pressure, 62. First phase, 22.5 per cent.; second phase, 9.6 per cent.; third phase, fourth phase, 67.7 per cent.

Third observation, the next day: Pulse-pressure, 68. First phase, 11.7 per cent.; second phase, 29.4 per cent.; third phase, fourth phase, 58.8 per cent.

Fourth observation, six days later: Pulse-pressure, 72. First phase, second phase, 30.5 per cent.; third phase, fourth phase, 69.4 per cent.

Fifth observation, one week later: Pulse-pressure, 80. First phase, 12.5 per cent.; second phase, 30.0 per cent.; third phase, fourth phase, 57.5 per cent.

Sixth observation, twenty-two days later: Pulse-pressure, 80. First phase, 12.5 per cent.; second phase, 37.5 per cent.; third phase, fourth phase, 50.0 per cent.

Seventh observation, one week later: Pulse-pressure, 70. First phase, 11.4 per cent.; second phase, 31.4 per cent.; third phase, fourth phase, 57.1 per cent.

Case 189.—Male, aged about 50 years. First observation: Pulse-pressure, 60. First phase, 10.0 per cent.; second phase, 18.3 per cent.; third phase, fourth phase, 71.6 per cent.

Second observation, four weeks later: Pulse-pressure, 40. No phases.

Sixteen observations were made in these six cases of chronic nephritis. The fourth point was absent at twelve and the first and fourth points were absent at one. It was possible to work out the C. S. = C. W. ratio at three observations. In Case 45, a male, aged 77 years, at the fourth observation, made after the patient had been under treatment for nearly four months, C. S. : C. W. :: 57.6 : 42.2. The patient's physical condition was definitely improved at this time.

In Case 128, a male, aged 70 years, the C. S. : C. W. :: 70 : 30 at the time he was first seen. He was recovering from an attack of acute dilation of the heart, with dropsy. Case 178 was that of a male, aged 64 years, who was under continuous observation for four and one-half months. The patient had chronic parenchymatous nephritis, with hypertrophy of the heart and general arteriosclerosis. In May, 1912, he had an attack of numbness in his left arm and leg, vertigo, and diminished urinary output, and fell while going upstairs. The fourth point was absent during two weeks' hospital treatment, and on one occasion the first point was also absent. At the end of two weeks he had improved enough to be allowed to leave the hospital. He died suddenly about three weeks after the last observation was made.

IV. Diseases of the Respiratory System

(*a*) *Consolidation of the Apices of the Lungs:*

There were three cases of consolidation of the apices of the lungs: Cases 33, 74, and 134.

Case 33.—Female, aged 51 years. Pulse-pressure, 25. First phase, 28.0 per cent.; second phase, 40.0 per cent.; third phase, fourth phase, 32.0 per cent.

Case 74.—Female, aged 27 years. Pulse-pressure, 48. First phase, 31.2 per cent.; second phase, 39.5 per cent.; third phase, fourth phase, 29.1 per cent.

Case 134.—Female, aged 33 years. First observation: Pulse-pressure, 58. No phases.

Second observation, twenty-six days later: Pulse-pressure, 40. First phase, 32.5 per cent.; second phase, 30.0 per cent.; third phase, fourth phase, 37.5 per cent.

(*b*) *Pulmonary Emphysema:*

There were five cases of pulmonary emphysema: Cases 40, 96, 147, 148, and 157.

Case 40.—Female, aged 60 years. Pulse-pressure, 39. First phase, 10.2 per cent.; second phase, 38.4 per cent.; third phase, 12.8 per cent.; fourth phase, 38.4 per cent. C. S. : C. W. :: 51.2 : 48.6.

Case 96.—Female, aged 76 years. First observation: Pulse-pressure, 92. First phase, 6.5 per cent.; second phase, 13.0 per cent.; third phase, fourth phase, 80.4 per cent.

Second observation, one month later: Pulse-pressure, 100. First phase, 11.0 per cent.; second phase, 11.0 per cent.; third phase, 68.0 per cent.; fourth phase, 10.0 per cent. C. S. : C. W. :: 79 : 21.

Case 147.—Female, aged 68 years. Pulse-pressure, 75. No phases.

Case 148.—Female, aged 53 years. Pulse-pressure, 90. First phase, 2.2 per cent.; second phase, 14.4 per cent.; third phase, fourth phase, 83.3 per cent.

Case 157.—Female, aged about 50 years. First observation: Pulse-pressure, 35. First phase, 22.8 per cent.; second phase, 37.1 per cent.; third phase, 11.4 per cent.; fourth phase, 28.5 per cent. C. S. : C. W. :: 48.5 : 51.3.

Second observation, six weeks later: Pulse-pressure, 44. First phase, 36.3 per cent.; second phase, 13.6 per cent.; third phase, 31.8 per cent.; fourth phase, 18.1 per cent. C. S. : C. W. :: 45.4 : 54.4.

(*c*) *Subacute Bronchitis:*

Case 43 was a case of subacute bronchitis. Female, aged 15 years. Pulse-pressure, 59. No phases.

(*d*) *Bronchial Asthma:*

Case 141 was a case of bronchial asthma. Female, aged 65 years. Pulse-pressure, 73. No phases.

At the four observations made on the three cases of consolidation of the lungs the fourth point was absent at three, and all points except the first and the fifth were absent at the other.

In the five cases of pulmonary emphysema seven observations were made. At two the fourth point was absent; at one all points except the first and fifth were absent. At the other four the C. S. = C. W. ratio could be worked out. At two of these the C. S. factor was greater than the C. W. factor; at the other two the C. W. factor was greater than the C. S. factor. The two latter observations were made in the case of a female, aged about 50 years, who in addition to definite pulmonary emphysema was overweight, and whose myocardium might have been considered hampered by excessive epicardial fat.

In the case of subacute bronchitis, a girl, aged 15 years, who had a flabby musculature, all points were absent except the first and the fifth.

In the case of bronchial asthma all points were absent except the first and the fifth.

V. Gastro-Intestinal Diseases

(*a*) *Gastroptosis:*

There were four cases of gastroptosis: Cases 31, 49, 84, and 91.

Case 31.—Female, aged 53 years. First observation: Pulse-pressure, 26. First phase, 30.7 per cent.; second phase, 38.4 per cent.; third phase, fourth phase, 30.7 per cent.

Second observation, six weeks later: Pulse-pressure, 30. No phases.

Case 49.—Female, aged 45 years. First observation: Pulse-pressure, 48. No phases.

Second observation, six weeks later: Pulse-pressure, 45. No phases.

Case 84.—Female, aged 49 years. Pulse-pressure, 64. First phase, 14.0 per cent.; second phase, 15.6 per cent.; third phase, 59.3 per cent.; fourth phase, 10.9 per cent. C. S. : C. W. :: 74.9 : 24.9.

Case 91.—Female, aged 33 years. Pulse-pressure, 55. First phase, 18.1 per cent.; second phase, 29.0 per cent.; third phase, fourth phase, 52.7 per cent.

(*b*) *Gastrectasia:*

There were seven cases of gastrectasia: Cases 62, 70, 88, 90, 114, 168, and 196.

Case 62.—Female, aged 44 years. First observation: Pulse-pressure, 34. First phase, 29.4 per cent.; second phase, 14.7 per cent.; third phase, fourth phase, 55.8 per cent.

Second observation, three weeks later: Pulse-pressure, 21. First phase, 9.5 per cent.; second phase, 28.5 per cent.; third phase, fourth phase, 61.9 per cent.

Case 70.—Female, aged 38 years. Pulse-pressure, 38. First phase, 34.2 per cent.; second phase, 42.1 per cent.; third phase, fourth phase, 23.6 per cent.

Case 88.—Female, aged 33 years. First observation: Pulse-pressure, 35. First phase, 42.8 per cent.; second phase, 14.2 per cent.; third phase, 28.5 per cent.; fourth phase, 14.2 per cent. C. S. : C. W. :: 42.7 : 57.0.

Second observation, three weeks later: Pulse-pressure, 46. First phase, 26.0 per cent.; second phase, 52.1 per cent.; third phase, fourth phase, 21.7 per cent.

Third observation, three weeks later: Pulse-pressure, 20. First phase, 25.0 per cent.; second phase, 10.0 per cent.; third phase, fourth phase, 65.0 per cent.

Case 90.—Female, aged 44 years. Pulse-pressure, 65. No phases.

Case 114.—Female, aged 32 years. Pulse-pressure, 42. No phases.

Case 168.—Male, aged about 35 years. Pulse-pressure, 35. No phases.

Case 196.—Female, aged about 60 years. First observation: Pulse-pressure, 43. First phase, 34.8 per cent.; second phase, 30.2 per cent.; third phase, fourth phase, 34.8 per cent.

Second observation, one month later: Pulse-pressure, 43. First phase, 58.1 per cent.; second phase, 27.9 per cent.; third phase, fourth phase, 13.9 per cent.

(*c*) *Hypertrophic Cirrhosis of the Liver:*

There were three cases of hypertrophic cirrhosis of the liver: Cases 10, 32, and 127.

Case 10.—Male, aged 36 years. Pulse-pressure, 67. First phase, second phase, 25.3 per cent.; third phase, 67.1 per cent.; fourth phase, 7.4 per cent.

Case 32.—Male, aged 32 years. First observation: Pulse-pressure, 68. First phase, 17.3 per cent.; second phase, 33.8 per cent.; third phase, 42.6 per cent.; fourth phase, 5.8 per cent. C. S. : C. W. :: 76.4 : 23.1.

Second observation, three weeks later: Pulse-pressure, 52. First phase, 32.6 per cent.; second phase, 19.2 per cent.; third phase, 19.2 per cent.; fourth phase, 28.8 per cent. C. S. : C. W. :: 38.4 : 61.4.

CASE 127.—Female, aged 37 years. First observation: Pulse-pressure, 30. No phases.

Second observation, six weeks later: Pulse-pressure, 37. No phases.

(*d*) *Atrophic Cirrhosis of the Liver:*

Case 171 was a case of atrophic cirrhosis of the liver. Male, aged 57 years. Pulse-pressure, 75. No phases.

(*e*) *Cholecystitis:*

There were two cases of cholecystitis: Cases 13 and 104.

CASE 13.—Female, aged 49 years. First observation: Pulse-pressure, 31. No phases.

Second observation, two months later: Pulse-pressure, 58. No phases.

CASE 104.—Female, aged 47 years. Pulse-pressure, 42. First phase, 23.8 per cent.; second phase, 33.3 per cent.; third phase, fourth phase, 42.8 per cent.

(*f*) *Carcinoma of the Liver:*

Case 44 was a case of carcinoma of the liver. Female, aged 58 years. Pulse-pressure, 65. First phase, 18.4 per cent.; second phase, 27.6 per cent.; third phase, 9.2 per cent.; fourth phase, 44.6 per cent. C. S. : C. W. :: 36.8 : 63.0.

(*g*) *Carcinoma of the Intestine:*

There were two cases of carcinoma of the intestine: Cases 77 and 99.

CASE 77.—Male, aged 68 years. First observation: Pulse-pressure, 45. First phase, 13.3 per cent.; second phase, 35.5 per cent.; third phase, fourth phase, 51.1 per cent.

Second observation, four weeks later: Pulse-pressure, 48. First phase, 10.2 per cent.; second phase, 27.0 per cent.; third phase, 45.8 per cent.; fourth phase, 16.6 per cent. C. S. : C. W. :: 72.8 : 26.8.

CASE 99.—Female, aged 62 years. Pulse-pressure, 35. First phase, 34.2 per cent.; second phase, 14.2 per cent.; third phase, fourth phase, 51.4 per cent.

(*h*) *Mucous Colitis:*

Case 36 was a case of mucous colitis. Female, aged 60 years. First observation: Pulse-pressure, 29. No phases.

Second observation, six weeks later: Pulse-pressure, 70. No phases.

Third observation, two weeks later: Pulse-pressure, 40. First phase, 37.5 per cent.; second phase, 25.0 per cent.; third phase, fourth phase, 37.5 per cent.

(*i*) *Chronic Tonsillitis:*

Case 81 was a case of chronic tonsillitis. Male, aged about 30 years. Pulse-pressure, 49. First phase, 22.4 per cent.; second phase, 8.1 per cent.; third phase, fourth phase, 69.3 per cent.

In the four cases of gastroptosis six observations were made. At two the fourth point was absent. At three all points were absent except the first and the fifth. At one, a female, aged 49 years, the C. S. : C. W. :: 74.9 : 24.9.

In the seven cases of gastrectasia eleven observations were made. The fourth point was absent at seven, and all points except the first and the fifth were absent at three. The C. S. = C. W. ratio could be worked out at one, at which the latter was greater than the former.

In the three cases of hypertrophic cirrhosis of the liver five observations were made. At two all points were absent except the first and the fifth; at one the first point was absent. At two it was possible to determine the C. S. = C. W. ratio. On one occasion the former was greater than the latter; on the other the latter was greater than the former.

In the case of atrophic cirrhosis of the liver all points were absent except the first and the fifth.

In the two cases of cholecystitis three observations were made. At two all points were absent except the first and the fifth; at the third the fourth point was absent.

In the case of carcinoma of the liver the C. S. : C. W. :: 36.8 : 63.

In one of the cases of carcinoma of the intestine the fourth point was absent at the first observation; at the second observation all points were present and C. S. : C. W. :: 72.8 : 26.8.

In the case of mucous colitis three observations were made. At the first two all points were absent except the first and the fifth; at the last the fourth point was absent.

In the case of chronic tonsillitis the fourth point was absent.

VI. Diseases of the Nervous System

(*a*) *Neurasthenia:*

There were twenty-three cases of neurasthenia: Cases 12, 20, 23, 41, 48, 61, 64, 68, 69, 109, 111, 131, 133, 137, 139, 142, 143, 160, 163, 169, 172, 191, and 195.

Case 12.—Female, aged 38 years. Pulse-pressure, 37. No phases.

Case 20.—Female, aged 35 years. First observation: Pulse-pressure, 45. First phase, 20.0 per cent.; second phase, 24.4 per cent.; third phase, 22.2 per cent.; fourth phase, 33.3 per cent. C. S. : C. W. :: 46.6 : 53.3.

Second observation, six weeks later: Pulse-pressure, 31. No phases.

CASE 23.—Female, aged 30 years. First observation: Pulse-pressure, 55. First phase, 27.2 per cent.; second phase, 27.2 per cent.; third phase, 30.9 per cent.; fourth phase, 14.5 per cent. C. S. : C. W. :: 58.1 : 41.7.

Second observation, three months later: Pulse-pressure, 41. First phase, 34.1 per cent.; second phase, 26.8 per cent.; third phase, fourth phase, 39.0 per cent.

CASE 41.—Female, aged 36 years. Pulse-pressure, 45. First phase, 17.7 per cent.; second phase, 48.8 per cent.; third phase, fourth phase, 33.3 per cent.

CASE 48.—Male, aged 36 years. First observation: Pulse-pressure, 40. First phase, 25.0 per cent.; second phase, 25.0 per cent.; third phase, fourth phase, 50.0 per cent.

Second observation, one month later: Pulse-pressure, 42. First phase, 21.4 per cent.; second phase, 35.7 per cent.; third phase, fourth phase, 42.8 per cent.

CASE 61.—Female, aged 38 years. Pulse-pressure, 33. First phase, 30.3 per cent.; second phase, 24.2 per cent.; third phase, 24.2 per cent.; fourth phase, 21.2 per cent. C. S. : C. W. :: 48.4 : 51.5.

CASE 64.—Female, agd 53 years. First observation: Pulse-pressure, 40. First phase, second phase, 30.0 per cent.; third phase, fourth phase, 70.0 per cent.

Second observation, one month later: Pulse-pressure, 30. First phase, 30.0 per cent.; second phase, 50.0 per cent.; third phase, fourth phase, 20.0 per cent.

CASE 68.—Male, aged 27 years. First observation: Pulse-pressure, 56. No phases.

Second observation, six weeks later: Pulse-pressure, 57. First phase, 43.8 per cent.; second phase, 8.7 per cent.; third phase, 19.2 per cent.; fourth phase, 28.0 per cent. C. S. : C. W. :: 27.9 : 71.8.

Third observation, two weeks later: Pulse-pressure, 45. No phases.

CASE 69.—Female, aged 29 years. Pulse-pressure, 44. First phase, 22.7 per cent.; second phase, 27.2 per cent.; third phase, 6.8 per cent.; fourth phase, 43.1 per cent. C. S. : C. W. :: 34.0 : 65.8.

CASE 109.—Male, aged 30 years. Pulse-pressure, 40. First phase, 25.0 per cent.; second phase, 25.0 per cent.; third phase, fourth phase, 50.0 per cent.

CASE 111.—Female, aged 30 years. Pulse-pressure, 25. No phases.

CASE 131.—Female, aged 26 years. First observation: Pulse-pressure, 52. No phases.

Second observation, six weeks later: Pulse-pressure, 40. First phase, second phase, third phase, 87.5 per cent.; fourth phase, 12.5 per cent.

CASE 133.—Female, aged 25 years. Pulse-pressure, 36. First phase, 16.6 per cent.; second phase, 50.0 per cent.; third phase, fourth phase, 33.3 per cent.

CASE 137.—Male, aged 54 years. First observation: Pulse-pressure, 47. First phase, 8.5 per cent.; second phase, 21.2 per cent.; third phase, fourth phase, 70.2 per cent.

Second observation, one month later: Pulse-pressure, 31. No phases.

Third observation, one month later: Pulse-pressure, 50. First phase, 10.0 per cent.; second phase, 20.0 per cent.; third phase, fourth phase, 70.0 per cent.

CASE 139.—Male, aged 39 years. First observation: Pulse-pressure, 46. First phase, 17.3 per cent.; second phase, 28.2 per cent.; third phase, 26.0 per cent.; fourth phase, 28.2 per cent. C. S. : C. W. :: 54.2 : 45.5.

Second observation, one month later: Pulse-pressure, 34. First phase, 29.4 per cent.; second phase, 44.1 per cent.; third phase, fourth phase, 26.4 per cent.

Case 142.—Female, aged 30 years. Pulse-pressure, 34. First phase, 17.6 per cent.; second phase, 29.4 per cent.; third phase, fourth phase, 52.9 per cent.

Case 143.—Female, aged 35 years. Pulse-pressure, 38. First phase, 18.4 per cent.; second phase, 13.1 per cent.; third phase, fourth phase, 68.4 per cent.

Case 160.—Male, aged 35 years. First observation: Pulse-pressure, 33. First phase, 30.3 per cent.; second phase, 63.6 per cent.; third phase, fourth phase, 6.0 per cent.

Second observation, one month later: Pulse-pressure, 44. First phase, 38.6 per cent.; second phase, 52.2 per cent.; third phase, 4.5 per cent.; fourth phase, 4.5 per cent. C. S. : C. W. :: 56.7 : 43.1.

Case 163.—Male, aged 57 years. First observation: Pulse-pressure, 77. First phase, 27.2 per cent.; second phase, 6.4 per cent.; third phase, fourth phase, 66.2 per cent.

Second observation, three weeks later: Pulse-pressure, 72. No phases.

Case 169.—Female, aged about 35 years. Pulse-pressure, 41. No phases.

Case 172.—Male, aged about 35 years. Pulse-pressure, 58. First phase, 22.4 per cent.; second phase, 24.1 per cent.; third phase, fourth phase, 53.4 per cent.

Case 191.—Female, aged about 40 years. Pulse-pressure, 37. First phase, 37.8 per cent.; second phase, 16.2 per cent.; third phase, fourth phase, 45.9 per cent.

Case 195.—Female, aged about 45 years. Pulse-pressure, 37. First phase, 13.5 per cent.; second phase, 43.2 per cent.; third phase, fourth phase, 43.2 per cent.

(*b*) *Hysteria:*

There were two cases of hysteria: Cases 1 and 152.

Case 1.—Female, aged 52 years. Pulse-pressure, 47. First phase, 21.2 per cent.; second phase, 57.4 per cent.; third phase, fourth phase, 21.2 per cent.

Case 152.—Female, aged 31 years. Pulse-pressure, 34. First phase, 14.7 per cent.; second phase, 44.1 per cent.; third phase, 29.4 per cent.; fourth phase, 11.7 per cent. C. S. : C. W. :: 73.5 : 26.4.

(*c*) *Locomotor Ataxia:*

There were two cases of locomotor ataxia: Cases 103 and 194.

Case 103.—Male, aged 54 years. Pulse-pressure, 127. First phase, 5.5 per cent.; second phase, 7.8 per cent.; third phase, 70.8 per cent.; fourth phase, 16.7 per cent. C. S. : C. W. : : 78.6 : 21.2.

Case 194.—Male, aged about 45 years. Pulse-pressure, 45. First phase, 13.3 per cent.; second phase, 28.8 per cent.; third phase, fourth phase, 57.7 per cent.

(*d*) *General Paresis:*

Case 54 was a case of general paresis. Male, aged 37 years. Pulse-pressure, 35. First phase, 40.0 per cent.; second phase, 42.8 per cent.; third phase, fourth phase, 17.1 per cent.

(*e*) *Reflex Vomiting:*

Case 55 was a case of reflex vomiting. Female, aged 35 years. Pulse-pressure, 47. First phase, 27.6 per cent.; second phase, 8.5 per cent.; third phase, 17.0 per cent.; fourth phase, 46.8 per cent. C. S. : C. W. :: 25.5 : 74.4.

(*f*) *Melancholia:*

Case 102 was a case of melancholia. Male, aged 62 years. Pulse-pressure, 51. First phase, 27.4 per cent.; second phase, 39.2 per cent.; third phase, fourth phase, 33.3 per cent.

In the twenty-three cases of neurasthenia thirty-five observations were made. At seventeen the fourth point was absent; at one the first and the fourth points were absent; at one the second and the third points were absent; and at nine all points were absent except the first and fifth. At three observations the C. S. was greater than the C. W.; at four the C. W. was greater than the C. S.

In one of the cases of hysteria the fourth point was absent; in the other case the C. S. : C. W. :: 73.5 : 26.4.

In one of the cases of locomotor ataxia the C. S. : C. W. :: 78.6 : 21.2; in the other the fourth point was absent.

In the case of general paresis the fourth point was absent.

In the case of reflex vomiting C. S. : C. W. :: 25.5 : 74.4.

In the case of melancholia the fourth point was absent.

VII. Diseases of Metabolism

(*a*) *Obesity:*

There were eight cases of obesity: Cases 63, 66, 76, 101, 145, 146, 149, and 192.

Case 63.—Female, aged 21 years. Pulse-pressure, 46. First phase, 15.2 per cent.; second phase, 47.8 per cent.; third phase, 10.8 per cent.; fourth phase, 26.0 per cent. C. S. : C. W. :: 58.6 : 41.2.

Case 66.—Male, aged 42 years. First observation: Pulse-pressure, 48. No phases.

Second observation, six months later: Pulse-pressure, 55. First phase, 9.0 per cent.; second phase, 32.7 per cent.; third phase, 18.1 per cent.; fourth phase, 40.0 per cent. C. S. : C. W. :: 50.8 : 49.0.

Case 76.—Male, aged 42 years. Pulse-pressure, 51. First phase, 25.4 per cent.; second phase, 23.5 per cent.; third phase, 15.6 per cent.; fourth phase, 35.2 per cent. C. S. : C. W. :: 39.1 : 60.6.

Case 101.—Female, aged 31 years. Pulse-pressure, 77. First phase, second phase, 6.4 per cent.; third phase, fourth phase, 93.5 per cent.

Case 145.—Male, aged 43 years. Pulse-pressure, 75. First phase, 20.0 per

cent.; second phase, 24.0 per cent.; third phase, 40.0 per cent.; fourth phase, 16.0 per cent. C. S. : C. W. :: 64 : 36.

Case 146.—Female, aged 50 years. Pulse-pressure, 63. No phases.

Case 149.—Male, aged 39 years. Pulse-pressure, 46. First phase, 23.9 per cent.; second phase, 34.7 per cent.; third phase, 19.5 per cent.; fourth phase, 21.7 per cent. C. S. : C. W. :: 54.2 : 45.6.

Case 192.—Male, aged about 55 years. Pulse-pressure, 100. No phases.

(*b*) *Alcoholism:*

There were nine cases of alcoholism: Cases 22, 58, 79, 80, 115, 126, 158, 164, and 187.

Case 22.—Male, aged 45 years. Pulse-pressure, 59. First phase, 18.6 per cent.; second phase, 27.1 per cent.; third phase, 11.8 per cent.; fourth phase, 42.3 per cent. C. S. : C. W. :: 38.9 : 60.9.

Case 58.—Male, aged 40 years. First observation: Pulse-pressure, 60. First phase, 33.3 per cent.; second phase, 33.3 per cent.; third phase, 11.6 per cent.; fourth phase, 21.6 per cent. C. S. : C. W. :: 44.9 : 54.9.

Second observation, two months later: Pulse-pressure, 56. First phase, 17.8 per cent.; second phase, 33.9 per cent.; third phase, 8.9 per cent.; fourth phase, 39.2 per cent. C. S. : C. W. :: 42.8 : 57.0.

Case 79.—Male, aged about 70 years. Pulse-pressure, 93. First phase, 10.7 per cent.; second phase, 3.2 per cent.; third phase, fourth phase, 86.0 per cent.

Case 80.—Male, aged about 50 years. Pulse-pressure, 55. First phase, 16.3 per cent.; second phase, 30.9 per cent.; third phase, 9.0 per cent.; fourth phase, 43.6 per cent. C. S. : C. W. :: 39.9 : 59.9.

Case 115.—Male, aged 48 years. Pulse-pressure, 57. First phase, 17.5 per cent.; second phase, 28.0 per cent.; third phase, 45.6 per cent.; fourth phase, 8.7 per cent. C. S. : C. W. :: 73.6 : 26.2.

Case 126.—Male, aged about 50 years. Pulse-pressure, 85. First phase, 7.0 per cent.; second phase, 16.4 per cent.; third phase, fourth phase, 76.3 per cent.

Case 158.—Female, aged about 65 years. First observation: Pulse-pressure, 82. First phase, 18.2 per cent.; second phase, 24.3 per cent.; third phase, fourth phase, 57.3 per cent.

Second observation, six weeks later: Pulse-pressure, 86. First phase, 11.6 per cent.; second phase, 18.6 per cent.; third phase, 27.9 per cent.; fourth phase, 41.8 per cent. C. S. : C. W. :: 46.5 : 53.4.

Case 164.—Male, aged 48 years. Pulse-pressure, 70. First phase, 28.5 per cent.; second phase, 22.8 per cent.; third phase, 37.1 per cent.; fourth phase, 11.4 per cent. C. S. : C. W. :: 59.9 : 39.9.

Case 187.—Male, aged 35 years. First observation: Pulse-pressure, 40. First phase, 12.5 per cent.; second phase, 50.0 per cent.; third phase, fourth phase, 37.5 per cent.

Second observation, one month later: Pulse-pressure, 54. First phase, 46.2 per cent.; second phase, 1.8 per cent.; third phase, fourth phase, 51.8 per cent.

(*c*) *Arthritis Deformans:*

There were two cases of arthritis deformans: Cases 25 and 138.

CASE 25.—Male, aged 57 years. First observation: Pulse-pressure, 37. First phase, 10.8 per cent.; second phase, 21.6 per cent.; third phase, fourth phase, 67.5 per cent.

Second observation, six weeks later: Pulse-pressure, 42. First phase, 11.9 per cent.; second phase, 26.1 per cent.; third phase, fourth phase, 61.9 per cent.

Third observation, six weeks later: Pulse-pressure, 16. First phase, second phase, 81.2 per cent.; third phase, fourth phase, 18.7 per cent.

Fourth observation, five weeks later: Pulse-pressure, 50. First phase, 28.0 per cent.; second phase, 30.0 per cent.; third phase, fourth phase, 42.0 per cent.

Fifth observation, one week later: Pulse-pressure, 45. First phase, 20.0 per cent.; second phase, 15.5 per cent.; third phase, fourth phase, 64.4 per cent.

CASE 138.—Male, aged 47 years. Pulse-pressure, 36. First phase, 2.7 per cent.; second phase, 38.8 per cent.; third phase, fourth phase, 58.3 per cent.

(*d*) *Toxic Arthritis:*

Case 93 was a case of toxic arthritis. Female, aged 28 years. First observation: Pulse-pressure, 50. No phases.

Second observation, six weeks later: Pulse-pressure, 39. First phase, 51.2 per cent.; second phase, 23.0 per cent.; third phase, fourth phase, 25.6 per cent.

(*e*) *Diabetes Mellitus:*

Case 154 was a case of diabetes mellitus. Male, aged 48 years. Pulse-pressure, 47. First phase, 21.2 per cent.; second phase, 25.5 per cent.; third phase, 40.4 per cent.; fourth phase, 12.7 per cent. C. S. : C. W. :: 65.9 : 33.9.

Nine observations were made in the eight cases of obesity. At three all points were absent except the first and the fifth; at one the first and the fourth points were absent. At four observations the C. S. factor was greater than the C. W. factor; at one the C. W. factor was greater than the C. S. factor. The influence of excessive fat deposit on the cardiac action is well known. In all four of the patients in whom the C. S. factor was in excess of the C. W. factor the examination of the heart showed no evidence of weakness; in the patient in whom the reverse condition obtained, however, there was definite cardiac weakness.

Twelve observations were made in the nine cases of alcoholism. At five the fourth point was absent. At five the C. W. factor was greater than the C. S. factor. At two the C. S. factor was greater than the C. W. factor.

In one of the cases of arthritis deformans five observations were made. The patient had definite evidence of cardiac weakness. At the first observation the fourth point was absent; at the second observation the fourth point was absent in spite of a course of carbonated brine baths given for the purpose of improving the cardiac weakness; at the

third observation the first and the fourth points were absent; at the fourth and fifth observations the fourth point was absent.

In the other case the fourth point was absent. This patient also had definite evidence of cardiac weakness.

In the case of toxic arthritis, a female, aged 28 years, with definite evidence of cardiac weakness, all points were absent at the first observation except the first and the fifth. Six weeks later, after treatment, the fourth point was absent.

In the case of diabetes mellitus the C. S. : C. W. :: 65.9 : 33.9.

VIII. Miscellaneous Diseases

(*a*) *Convalescent Patients:*

Case 28 was convalescent from influenza. Male, aged 53 years. Pulse-pressure, 46. First phase, 13.0 per cent.; second phase, 39.1 per cent.; third phase, 39.1 per cent.; fourth phase, 8.6 per cent. C. S. : C. W. :: 78.2 : 21.6.

Case 122 was convalescent from a severe streptococcus infection. Female, aged 34 years. Pulse-pressure, 38. First phase, 26.3 per cent.; second phase, 13.1 per cent.; third phase, fourth phase, 60.5 per cent.

Case 154 was convalescent from a major surgical operation (complete hysterectomy). Female, aged 45 years. First observation: Pulse-pressure, 90. First phase, 14.4 per cent.; second phase, 24.4 per cent.; third phase, fourth phase, 61.1 per cent.

Second observation, twenty-six days later: Pulse-pressure, 85. First phase, 11.7 per cent.; second phase, 29.4 per cent.; third phase, 54.1 per cent.; fourth phase, 4.7 per cent. C. S. : C. W. :: 83.5 : 16.4.

(*b*) *Acute Articular Rheumatism:*

Case 8 was a case of acute articular rheumatism. Female, aged 58 years. Pulse-pressure, 98. First phase, 10.2 per cent.; second phase, 10.2 per cent.; third phase, 74.4 per cent.; fourth phase, 5.1 per cent. C. S. : C. W. :: 84.6 : 15.3.

(*c*) *Prostatitis:*

Case 94 was a case of prostatitis. Male, aged 26 years. Pulse-pressure, 32. First phase, 21.8 per cent.; second phase, 62.5 per cent.; third phase, fourth phase, 15.6 per cent.

(*d*) *Hay Fever:*

Case 199 was a case of hay fever. Female, aged about 35 years. Pulse-pressure, 33. First phase, 12.1 per cent.; second phase, 66.6 per cent.; third phase, fourth phase, 21.2 per cent.

(*e*) *Hyperthyroidism:*

Case 27 was a case of hyperthyroidism. Female, aged about 40 years. Pulse-pressure, 50. First phase, 20.0 per cent.; second phase, 30.0 per cent.; third phase, fourth phase, 50.0 per cent.

In the patient convalescent from influenza the C. S. : C. W. :: 78.2 : 21.6.

In the patient convalescent from a severe streptococcus infection the fourth point was absent.

In the patient convalescent from a complete hysterectomy the fourth point was absent at the first observation, and after treatment the C. S. : C. W. :: 83.5 : 16.4.

In the case of articular rheumatism C. S. : C. W. :: 84.6 : 15.3.

In the case of prostatitis the fourth point was absent.

In the case of hay fever the fourth point was absent.

In the case of hyperthyroidism the fourth point was absent.

A strong murmur phase is looked upon as indicative of cardiac strength and a poor second phase as indicative of cardiac weakness by Tornai,[27] Goodman and Howell,[10] and Fischer.[6] According to the observations of Goodman and Howell,[10, 11] the second phase in a normal individual forms 44.4 per cent. of the pulse-pressure. In a normal individual in my own series it formed 51.1 per cent. of the pulse-pressure.

The cases of cardiac disease have been grouped according as the myocardium could be considered competent or more or less decompensated. In Table IV the second phases of the cases in which good compensation was judged to be present will be found. In Table V the second phases of the cases in which decompensation existed are tabulated.

One hundred and forty-four observations were made in cases that were clinically competent. Of these, thirty-nine observations were above 40 per cent. and 105 were below 40 per cent. On the other hand, forty-four observations were made in cases which, at the time of observation, could be classed clinically as, at least partially, decompensated. Of these, only four observations gave a second phase forming more than 40 per cent. of the pulse-pressure. It appears to me that the length of the second phase is a better indicator of the competence of the myocardium than the clinical phenomena. Even in instances in which all the phases cannot be worked out a long second phase indicates a good heart muscle and one capable of being put in better physiological condition.

Among the observations made on the cases clinically compensated it was possible to work out the C. S. = C. W. ratio sixty-one times.

TABLE IV

Cases of Cardiac Disease Clinically Compensated

Case No.	Second phase	Case No.	Second phase	Case No.	Second phase	Case No.	Second phase
4	19.5	15	15.0	162	31.1	100	34.8
18	62.1	15	8.5	162	16.9	100	46.8
38	42.8	15	60.4	184	15.8	16	4.6
38	38.4	15	26.8	184	9.2	16	20.8
42	37.1	15	26.1	186	26.5	16	14.7
42	54.5	15	44.8	186	30.0	26	9.7
112	28.0	15	40.8	17	10.0	53	32.7
112	24.2	15	29.0	17	38.4	53	36.0
120	13.8	15	10.9	17	17.0	53	45.4
135	22.6	15	48.2	89	30.1	53	37.5
135	22.0	15	42.8	124	16.3	60	6.0
144	20.9	15	46.9	130	42.3	60	47.0
144	16.6	15	55.1	165	24.3	75	34.4
150	27.6	15	47.7	167	11.2	85	15.6
151	18.6	15	46.2	167	13.3	95	27.2
151	14.7	15	40.3	173	13.8	108	28.7
183	12.8	15	22.2	188	69.8	123	60.7
183	21.8	15	44.4	188	20.0	132	26.6
6	28.3	15	42.3	200	31.7	156	11.1
6	27.9	15	59.5	200	16.9	161	12.3
6	22.7	29	46.4	7	22.2	161	9.3
9	28.0	29	51.6	98	11.3	166	18.1
11	31.5	29	31.2	98	9.1	170	14.8
11	17.3	29	37.8	110	35.9	170	29.8
14	15.7	73	24.3	110	15.5	174	22.2
14	36.1	73	16.0	119	33.3	179	28.2
15	52.2	136	34.8	177	29.7	180	18.7
15	69.5	2	80.0	34	48.2	180	27.2
15	90.9	57	23.3	97	25.0	39	44.0
15	41.8	65	20.9	107	48.2	39	25.6
15	61.7	65	28.0	121	25.7	45	20.2
15	63.2	65	18.7	182	22.3	45	17.8
15	67.5	78	32.6	182	6.6	45	4.9
15	67.7	118	10.1	113	50.0	45	28.8
15	28.3	118	22.9	92	34.0	128	42.0
15	4.0	155	16.6	92	52.0	189	18.3

TABLE V

Cases of Cardiac Disease Clinically Decompensated

Case No.	Second phase	Case No.	Second phase	Case No.	Second phase	Case No.	Second phase
18	27.9	105	3.8	181	21.9	113	23.0
18	13.2	105	7.1	21	44.7	198	60.0
18	9.3	105	17.5	21	35.2	198	17.8
47	3.5	105	11.1	110	14.9	53	14.0
47	14.0	105	10.3	117	14.6	56	45.1
47	14.8	105	13.3	140	16.6	78	17.6
47	22.5	125	5.6	140	12.5	78	9.6
47	12.9	2	27.9	185	14.2	78	29.4
47	16.0	83	25.3	185	9.0	78	30.0
47	11.4	83	38.2	46	15.7	78	37.5
72	13.3	159	22.2	5	50.0	78	31.4

TABLE VI

Cases of Disease Other Than Cardiac

Second phase	C. S.=C. W. ratio
RESPIRATORY DISEASES	
40.0	
39.5	
30.0	
38.4	51.2: 48.6
13.0	
11.0	
14.4	
37.1	48.5: 51.3
13.6	45.4: 54.4
GASTRO-INTESTINAL DISEASES	
38.4	
15.6	
29.0	
14.7	
28.5	
42.1	
14.2	42.7: 57.0
10.0	
30.2	
27.9	
33.8	76.4: 23.1
19.2	38.4: 61.4
33.3	
27.6	
35.5	
27.0	72.8: 26.8
14.2	
25.0	
8.1	

Second phase	C. S.=C. W. ratio
DISEASES OF THE NERVOUS SYSTEM	
24.4	46.6: 53.3
27.2	58.1: 41.7
26.8	
48.8	
25.0	
35.7	
24.2	48.4: 51.5
50.0	
8.7	27.9: 71.8
27.2	34.0: 65.8
25.0	
50.0	
21.2	
20.0	
28.2	54.2: 45.5
44.1	
29.4	
13.1	
63.6	
52.2	56.7: 43.1
6.4	
24.1	
16.2	
43.2	
57.4	
44.1	73.5: 26.4
7.8	78.6: 21.2
28.8	
42.8	
8.5	25.5: 74.4
39.2	

Second phase	C. S.=C. W. ratio
DISEASES OF METABOLISM	
47.8	
32.7	50.8: 49.0
23.5	39.1: 60.6
24.0	64: 36
34.7	54.2: 45.6
27.1	38.9: 60.9
33.3	44.9: 54.9
33.9	42.8: 57.0
3.2	
30.9	39.9: 59.9
28.0	73.6: 26.2
16.4	
24.3	
18.6	46.5: 53.4
22.8	59.9: 39.9
50.0	
1.8	
21.6	
26.1	
30.0	
15.5	
38.8	
23.0	
25.5	65.9: 33.9
MISCELLANEOUS DISEASES	
39.1	78.2: 21.6
13.1	
24.4	
29.4	83.5: 16.4
10.2	84.6: 15.3
62.5	
66.6	
30.0	

In thirty-nine of these the C. S. factor was greater than the C. W. factor; in twenty-one the C. W. factor was greater than the C. S. factor; and in one the two factors were equal. In the decompensated cases, on the other hand, it was possible to work out the C. S. = C. W. ratio only eleven times. In five of these the C. S. factor was greater than the C. W. factor; in six the C. W. factor was greater than the C. S. factor.

It may be said that, as a rule, a second phase forming more than

40 per cent. of the pulse-pressure and a C. S. : C. W. ratio in which the C. S. factor is greater than the C. W. factor give a fairly reliable index of the competence of the myocardium.

Study of Table VI will show that in diseases of the respiratory system, of the gastro-intestinal tract, and of the nervous system the second phase is often below 40 per cent. and the C. W. factor is frequently larger than the C. S. factor. In these cases there is very frequently evidence of myocardial insufficiency. Take the cases of alcoholism, for example. There can be no doubt of the influence of alcohol on the myocardium, and in these the C. W. factor was greater than the C. S. factor five out of seven times, and the second phase was below 40 per cent. of the pulse-pressure at all observations except one. In that case a second observation, made a month after the first observation, gave a second phase of 1.8 per cent. of the pulse-pressure.

In Case 25, a patient suffering from arthritis deformans, there was definite evidence of cardiac weakness. The second phase formed 21.6 per cent., 26.1 per cent., 30.0 per cent., and 15.5 per cent. of the pulse-pressure at four observations. At the third observation of the series the second phase could not be determined.

I have not analyzed the length of the third phases in these cases because the frequent absence of the fourth point makes it impossible to work out the third phase. Again, when all points are present and the C. S. factor is greater than the C. W. factor a short second phase will be made up for by a longer third phase.

IV. COMPARISON OF THE RESULTS OBTAINED BY THE AUSCULTATORY METHOD WITH THOSE OBTAINED BY OTHER METHODS

(a) Palpatory Method:

The auscultatory method of blood-pressure determination gives a higher reading than the palpatory method, under like conditions, in nearly every case. Table VII gives the difference between the two in 100 consecutive cases not represented in Table I. The estimations were all made in the recumbent posture, with a Riva Rocci instrument and a 12-cm. cuff.

In one case the auscultatory and the palpatory readings were the same; in another case the palpatory method gave a reading two millimetres above that given by the auscultatory method. In the other ninety-eight cases the palpatory method gave a reading of from one

millimetre to thirty millimetres below that given by the auscultatory method—an average of 9.98 millimetres.

TABLE VII

Systolic Pressures by the Auscultatory and the Palpatory Methods

Auscultatory	Palpatory	Difference	Auscultatory	Palpatory	Difference
125	118	− 7	101	91	−10
124	100	−24	134	122	−12
118	108	−10	128	116	−12
156	150	−6	98	96	− 2
171	165	−6	124	120	− 4
102	87	−15	110	100	−10
122	116	− 6	112	102	−10
180	174	− 6	156	150	− 6
87	82	− 5	115	100	−15
97	94	− 3	97	93	− 4
104	100	− 4	108	101	− 7
122	118	− 4	169	159	−10
182	168	−14	110	89	−21
106	100	− 6	138	126	−12
95	91	− 4	190	180	−10
110	104	− 6	208	202	− 6
105	99	− 6	140	137	− 3
109	106	− 3	130	120	−10
141	129	−12	102	95	− 7
123	100	−23	130	124	− 6
88	78	−10	125	120	− 5
119	110	− 9	190	180	−10
110	96	−14	148	132	−16
131	106	−25	108	99	− 9
160	150	−10	112	108	− 4
130	122	− 8	86	80	− 6
142	118	−24	115	105	−10
110	100	−10	135	122	−13
130	118	−12	164	134	−30
97	89	− 8	180	160	−20
94	87	− 7	128	111	−17
106	96	−10	130	119	−11
110	91	−19	105	102	− 3
120	115	− 5	102	90	−12
107	90	−17	107	95	−12
100	96	− 4	134	120	−14
105	90	−15	210	180	−30
95	90	− 5	146	138	− 8
87	85	− 2	122	122	0
125	110	−15	130	118	−12
95	87	− 8	122	118	− 4
140	129	−11	105	104	− 1
104	98	− 6	154	140	−14
105	96	− 9	118	100	−18
149	145	− 4	138	132	− 6
148	134	−14	95	91	− 4
123	114	− 9	110	105	− 5
108	89	−19	134	125	− 9
105	95	−10	150	152	+ 2
100*	98	− 2	112	104	− 8

*First point absent.

These results correspond to those obtained by other writers. Fellner [8] found the auscultatory reading five to ten millimetres above the palpatory reading. In sixty-one cases Gittings [9] found the auscultatory method gave a result averaging 16.7 mm. higher than that obtained by the palpatory method. In two cases, on the other hand, he found the palpatory reading higher than the auscultatory reading. Prendergast's [21] results showed a systolic pressure obtained by the auscultatory method five to ten millimetres higher than that obtained by the palpatory method. Korotkow [14] found that the auscultatory method gave a systolic pressure ten to twelve millimetres higher and Warfield [30] found it eight to fourteen millimetres higher than by the palpatory method. Sterzing [24] and Fischer [6] also state that the systolic readings by the auscultatory method are higher than those by the palpatory method.

(*b*) *Visual Method:*

While the auscultatory method gives higher systolic pressures than the palpatory method, writers who have studied the subject from this viewpoint have found that the diastolic pressures obtained by the auscultatory method are lower than those obtained by the visual method (Sterzing [24]).

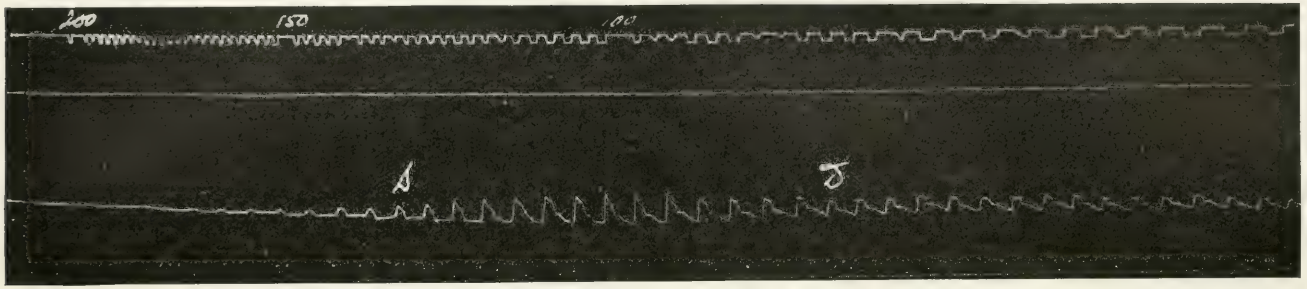
In forty-one cases Gittings [9] found that the diastolic pressure averaged 15.5 mm. lower by the former method than by the latter method. In five cases the diastolic pressure averaged 7.7 mm. higher by the auscultatory method than by the visual method. In two cases the readings were the same by both methods. In one case the diastolic pressure could not be determined by the auscultatory method; but in eleven cases, on the other hand, it could not be determined by the visual method.

O. Müller [20] believes that the diastolic pressure obtained by the auscultatory method is 28 per cent. lower than the true diastolic pressure and is, therefore, not to be trusted.

The determination of the diastolic pressure by the visual method has always seemed so unreliable that I have never employed it in my work.

The pulse-pressure by the auscultatory method can always be worked out. On account of the fact that in the majority of cases the systolic reading is higher by the auscultatory method than by the

Fig. 2.



Graphic method of blood-pressure determination. *S.*=Systolic pressure. *D.*=Diastolic pressure.

The above tracing shows the result of the record of blood-pressure taken in the case of a normal female adult, aged forty years. The systolic pressure is 128 mm.; the diastolic pressure is 80 mm. Just after this record was made the estimation of blood-pressure by the auscultatory method gave a systolic reading of 110 mm. and a diastolic reading of 70 mm. By the palpatory method the systolic pressure was 92 mm.

palpatory method and the diastolic pressure is lower by the auscultatory than by the visual method, the pulse-pressure determinations are usually a little higher than they work out by taking palpatory and visual readings. Ettinger [4] found the pulse-pressure 13.2 mm. higher and Gittings [9] 24 mm. higher by the auscultatory than by the older methods.

(*c*) *Graphic Method:*

Van Westenrijk [28] makes the remark that the sphygmographic method of determining blood-pressure is hardly suitable for daily practice. It requires an expensive and bulky piece of apparatus, and the readings are always higher with the sphygmograph. I have made eighteen comparative readings between the sphygmographic method, the auscultatory method, and the palpatory method. For the sphygmographic method I have used an Uskoff sphygmotomograph with a 12 cm. von Recklinghausen cuff.

The accompanying tracing (Fig. 2) shows the result of the record of blood-pressure taken in the case of a normal female adult, aged 40 years. The systolic pressure is 140 mm.; the diastolic pressure is 90 mm. Just before this record was made the estimation of blood-pressure by the auscultatory method gave a systolic reading of 128 and a diastolic reading of 75. By the palpatory method the systolic pressure was 111 mm.

Table VIII shows the result of a comparison of blood-pressure determinations made by the graphic method, the auscultatory method, and the palpatory method in seventeen cases. In one case the graphic method gave a result lower than that given by the auscultatory method. This was a case of hyperthyroidism in which the blood-pressure was unstable.

The Uskoff instrument gives a record of pulsations long before the blood stream comes through the artery either as determined by the auscultatory method or by the palpatory method. I ascribe this phenomenon to the pulsation of the proximal portion of the brachial artery against the upper border of the inflated cuff.

Zabel [32] has expressed the opinion that the graphic method of blood-pressure determination is too complicated on account of the instruments necessary. Schrumpf and Zabel,[22] however, found that the three methods—graphic, auscultatory, and palpatory—corresponded fairly well.

TABLE VIII

Comparison of the Auscultatory with the Graphic and Palpatory Methods

Graphic	Auscultatory	Palpatory	Diagnosis
160	139	126	Pulmonary tuberculosis.
126	129	111	Hyperthyroidism.
120	112	110	Mitral obstruction.
200	155	157	Chronic nephritis.
128	97	92	Tobacco heart.
198	152	145	Neurasthenia (?).
182	154	140	Hypertrophy of the heart.
140	122	118	Dilation of the heart.
158	135	125	Mitral regurgitation.
148	105	104	Hyperthyroidism.
184	137	130	Fibroid myocarditis.
168	128	91	Aortic regurgitation.
150	95	95	Mitral regurgitation.
130	125	112	Mitral regurgitation.
138	110	105	Hypertrophy of the heart.
162	135	122	Mitral regurgitation.
178	152	145	Arteriosclerosis.

V. ABSENT POINTS AND PHASES

It frequently happens that one or more points cannot be determined in making an auscultatory blood-pressure determination. The most usual anomaly is to find that after the murmur has disappeared the clear tap progressively diminishes in intensity until all sounds disappear, *absent fourth point.* Sometimes the murmur is the first sound heard as the pressure diminishes in the cuff, *absent first point.* Sometimes the first point is heard but no murmur can be heard, suddenly the tap becomes dulled, and finally the sounds disappear, *absent second and third points.* Again the murmur may be the first sound heard, and after it disappears the tap diminishes in intensity until the sounds disappear, *absent first and fourth points.* Sometimes all the points are absent except the first and the fifth, *no phases.*

These facts have been summarized in Chapter III in relation to the various groups of cases. It may be well in this place to recapitulate these findings: The fourth point was absent at 175 out of the 372 observations. All points except the first and the fifth were absent at seventy-three observations. The first point was absent at two observations: in a case of arteriosclerosis (Case 51) and in a case of hypertrophic cirrhosis of the liver (Case 10). The first and the fourth points were absent at seven observations: in a case of fibroid myocarditis (Case 86), in a case of parenchymatous myocarditis

(Case 106), in a case of arteriosclerosis (Case 95), in a case of nephritis (Case 178), in a case of neurasthenia (Case 64), in a case of obesity (Case 101), and in a case of arthritis deformans (Case 25). The second and third points were absent at four observations: in a case of fibroid myocarditis (Case 19), a case of mitral regurgitation (Case 35), a case of arteriosclerosis (Case 16), and a case of neurasthenia (Case 131). At one observation in a case of parenchymatous myocarditis (Case 15) the murmur appeared and disappeared coincidently with all sounds, absent fourth and fifth points. Gittings[9] has recorded absent phases, but it seems, in reading his text, that he has mixed absent points and absent phases. In his series, a male, aged 74 years, with myocarditis and nephritis, the second and fourth phases were absent. In a case of mitral regurgitation and tricuspid regurgitation with loss of compensation the third and fourth phases were absent. In another case of mitral regurgitation and tricuspid regurgitation all phases were absent. In another case of mitral regurgitation and tricuspid regurgitation with arteriosclerosis the third phase was absent. In a case of myocarditis and slight arteriosclerosis the third phase was absent. In a case of aortic regurgitation, mitral regurgitation, and tricuspid regurgitation the second and third phases were absent. In a case of myocarditis and marked arteriosclerosis the fourth phase was absent. Ettinger[4] found in twenty-eight cases of cardiac insufficiency with dyspnœa and œdema the third phase absent in nine. He believes the absence of the third phase indicates moderate cardiac weakness, while absence of all the phases (points) indicates that the weakness has reached a high degree. Fischer[6] has also noted the association of a short third phase with cardiac weakness. Absent phases have also been noted by Krylow,[34] and Tornai[27] states that the disappearance of the murmur phase indicates heart weakness.

VI. THE CLEARNESS OF THE SOUNDS IN ANÆMIAS

Ettinger[4] pointed out that in severe anæmias, when the blood-flow was more rapid than normal, the auscultatory sounds have been very clear. This statement has been confirmed by Goodman and Howell.[10, 11] While this is true in many instances, I have not found that it is an invariable accompaniment of anæmia, and I can see no diagnostic significance in the observation.

VII. ATYPICAL PHENOMENA

Goodman and Howell [10, 11] have called attention to tonal arrhythmias. By this term they mean variation in the intensity of successive tones or murmurs. They point out that tonal arrhythmias can be detected more easily than variations in the pulse-rate or than variations in the auscultatory phenomena produced in the cardiac cycle. Tornai [27] has also called attention to the same fact. The former authors believe that these tonal arrhythmias give important information in the diagnosis of cardiac neuroses, in which they are most apt to occur, and in other forms of cardiac irregularity. In my own experience I have heard tonal arrhythmia in few cases except those accompanied by definite cardiac irregularity. In cases of gross cardiac irregularity (auricular fibrillation, pulsus alternans, frequent extrasystoles) it is difficult to determine the first point because of the variation in the strength of the sounds produced with the different arterial pulsations. I have noted the following anomalies in persons with regular heart action: In an arteriosclerotic male, aged 56 years, one strong and two weak sounds could be heard during the fourth phase (Case 53). In another arteriosclerotic male, aged 52 years, the sounds entirely disappeared during the fourth phase and subsequently reappeared (Case 60). In the case of an arteriosclerotic female, aged 64 years, the first point was recorded at 150 mm. At 140 mm. the sounds entirely disappeared; at 130 mm. they reappeared; at 115 mm. they were heard loudest, and they then progressively diminished until they disappeared at 80 mm. (Case 75). The same train of events was observed in Case 85, an arteriosclerotic female, aged 52 years; in Case 97, a male, aged 65 years, with fat heart; in Case 101, an obese female, aged 31 years; and in Case 181, a female, aged 62 years, with mitral regurgitation. In Table I these observations are recorded as having all points absent except the first and the fifth. Similar observations to those mentioned above have since been made in a case of tuberculosis of the kidneys in a woman, aged 64 years; and in a case of mitral regurgitation in a woman, aged 49 years. In the latter case the patient died of acute dilation of the heart with acute pulmonary œdema about six weeks after the observation was made.

In one case, a female, aged 38 years, in whom a diagnosis of cholecystitis was made, no sounds could be heard at the bend of the

left elbow, although the usual sequence of sounds could be heard at the bend of the right elbow. I ascribed this abnormality to an anomaly in the course of the left brachial artery.

The beginner in using the auscultatory method will have some difficulty in distinguishing between the first point and sounds made by contraction of the cuff as the pressure is released. A little experience, however, will enable him to differentiate between sounds made in the cuff and the sounds produced in the brachial artery.

VIII. CONCLUSIONS

1. The auscultatory method is the most accurate and most convenient method of making blood-pressure determinations.

2. The first point should be considered the systolic or maximal pressure.

3. The fifth point should be considered the diastolic or minimal pressure, except in cases in which a sound can be heard in the brachial artery with no pressure in the cuff, in which case the fourth point should be considered to represent the diastolic pressure.

4. The pulse-pressure and the mean pressure can always be obtained by the auscultatory method.

5. The systolic pressure obtained by the auscultatory method is almost always higher than that obtained by the palpatory method, and lower than that obtained by the graphic method.

6. Whenever it is possible to work out the C. S. = C. W. ratio valuable information can be obtained concerning the functional ability of the myocardium at the time the observation is made.

7. It may be said, as a rule, that a second phase forming more than 40 per cent. of the pulse-pressure, and a C. S. = C. W. ratio in which the C. S. factor is greater than the C. W. factor, give a fairly reliable index of the competence of the myocardium.

8. Although one cannot make the C. S. = C. W. equation when one point or more is absent, a second phase of 40 per cent. or more of the pulse-pressure indicates a good heart muscle and one capable of being put in better physiological condition.

9. Absent points and tonal arrhythmias indicate cardiac muscle weakness.

REFERENCES

[1] Bickel: *Ztschr. f. exper. Path. u. Therap.*, Bd. v, H. 3, quoted by Zabel, *Berl. klin. Wchnschr.*, 1909, xlvi, 1352.
[2] Dehio: Nova. Acta. Abh. der Kais. Leop-Carol., *Deutsch. Akad. der Naturf.*, xcvii, No. 11.
[3] Ehret: *Munchen. med. Wchnschr.*, 1909, lvi, 959.
[4] Ettinger: *Wien. klin. Wchnschr.*, 1907, xx, 992.
[5] Federn: *Wien. klin. Wchnschr.*, 1909, Feb. 11.
[6] Fischer: *Deutsch. med. Wchnschr.*, 1908, xxxiv, 1141.
[7] Fischer: *Ztschr. f. diatet. u. physick. Therap.*, 1909, xii, 389.
[8] Fellner: *Verhandl. d. 24 Kong. f. inn. Med.*, 1907, xxiv, 404.
[9] Gittings: *Arch. Int. Med.*, 1910, vi, 196.
[10] Goodman and Howell: *Univ. Penn. Med. Bull.*, 1910, xxiii, 469.
[11] Goodman and Howell: *Amer. Jour. Med. Sci.*, 1911, cxlii, 334.
[12] Hirschfelder: "Diseases of the Heart and Aorta," Ed. 2, 1913, 33.
[13] Hooker and Southworth: *Arch. Int. Med.*, 1914, xiii, 384.
[14] Korotkow: *Mitt. d. k. mil. med. Akad. zu St. Petersburg*, 1905, ix, 365.
[15] Korotkow: *Vrach*, 1906, 128.
[16] Lang and Manswetowa: *Deutsch. Arch. f. klin. Med.*, 1908, xciv, 441, 455.
[17] Mackenzie: "A System of Medicine by Many Writers," edited by Thomas Clifford Allbutt, 1897, Ed. 2, vol. v.
[18] MacWilliam and Melvin: *Heart*, 1914, v, 153.
[19] Moritz: *Munchen. med. Wchnschr.*, 1909, lvi, 321.
[20] Müller: *Med. Klinik.*, 1908, Nos. 2 and 4.
[21] Prendergast: *New York Med. Jour.*, 1913, xcvii, 78.
[22] Schrumpf and Zabel: *München. med. Wchnschr.*, 1909, lvi, 704.
[23] Staehlin: *Verhandl. d. 26 Kongr. f. inn. Med.*, 1909, xxvi, 429.
[24] Sterzing: *Deutsch. med. Wchnschr.*, 1909, xxxv, 1874.
[25] Stone: *Jour. Am. Med. Assn.*, 1913, lxi, 1256.
[26] Taussig and Cook: *Arch. Int. Med.*, 1913, xi, 542.
[27] Tornai: *Ztschr. f. diatet. u. physik. Therap.*, Bd. xiii, H. 8 u. 9. Abstract in *Deutsch. med. Wchnschr.* 1909, xxxv, 2287.
[28] Van Westenrijk: *Ztschr. f. klin. Med.*, 1908. Abstract, *Deutsch. med. Wchnschr.*, 1909, xxxv, 1979.
[29] Warfield: *Arch. Int. Med.*, 1912, x, 258.
[30] Warfield: *Interstate Med. Jour.*, 1912, xix, 856.
[31] Warfield: *Jour. Am. Med. Assn.*, 1913, lxi, 1254.
[32] Zabel: *Berl. klin. Wchnschr.*, 1909, xlvi, 1352.
[33] Bozowski: Quoted by Gittings.[9]
[34] Krylow: Quoted by Gittings,[9] and Goodman and Howell.[10]

THE COMPLEXITIES OF SIMPLE CONSTIPATION

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The familiar is often the unimpressive. Ills and defects in our immediate families are very difficult of our proper appreciation and diagnosis; therefore we call in a colleague. The common is always the uninteresting, and, like other experiences, the constant repetition of minor diseases wearies the personal fervor and remedial skill of the physician, until the novel and the major are embraced as welcome mental fillips. For instance, the human family is much plagued with constipation, but so common is it in the family, and so frequently have the family doctors listened to its woes, that little wonder remains if sufficient, true diagnosis and treatment are many times disregarded or unknown.

All constipation may be clinically classed under one of three heads: Surgical constipation should include such cases as result from gross obstruction from strictures, parenteral bands, volvulus, invagination, local rectal or anal conditions, neoplasms, peritonitis, ileus, organic and muscular pelvic displacements. Medical constipation comprises the chronic form of the condition without gross primary anatomic change in the intestinal wall or in its serous covering and adnexa. The border-line division contains those in which there are very marked ptoses, kinks, pericolonic adhesions or membranes, either fetal or sub-inflammatory, and may require either medical or surgical interference, as conditions necessitate. The medical and border-line group will be considered in this paper, for they are the more common and familiar types of constipation.

Chronic medical constipation is usually regarded as a simple condition. In reality it is complex, and the failure to recognize that it may present various stages and pathological findings results in mistakes in diagnosis and much improper and unsuccessful treatment. It should be realized that the condition in the large surplus of cases starts as the so-called atonic form, characterized by mere deficiency

in the number of defecations and by little else; there is no pain before, during or after evacuation; there is no great amount of gas or mucus, and there are no marked distressing symptoms of systemic intoxication. The form and size of the stool may be normal, the abdomen not markedly distended, even flat; the large intestine cannot be palpated through the abdominal wall. This is the stage at which, if the patient present himself and the physician understand the values in constipation, proper advice and treatment may greatly aid or cure the sufferer, and save him years of future discomfort and progressive invalidism. The great commandment in the medical decalogue for the patient at this stage is, " Thou shalt not use physic, nor pills, nor salts, nor any other strong medicine."

We know that in constipation the fats, starches, proteins, and water are more completely digested and absorbed than in the normal intestine. We know that even in the healthy, few remnants of these ingesta can be found in the stool. The great bulk of the stool is water, bacteria, and cellulose from vegetables and cereals. Having then at this stage an intestine in which there are no lesions, we have clear indications for a mechanically stimulating diet,—that is, one large in bulk of water, fat, vegetables, fruits, and cereals,—so that as many food rests as possible may stimulate the intestinal walls. Such additional measures as the habit of regular toilet time, exercise, abdominal massage by the physician himself, agar, paraffin oil, and olive oil should go far toward a complete relief. In infants, fats may cause balance-disturbance, and should be combined or replaced by carbohydrates so far as possible. But eschew pills, for, once the pill habit is formed, it becomes not only an exacting master but a dangerous one. It does not cure: often it merely delays and causes future troubles; for after a few years either of no treatment or of pills, salts, and extract indulgence, the constant irritation of the retarded fæces begins to cause inflammation of the mucous membrane, especially of the colon, and the constant stimulation of the purgatives, taken in more drastic form and greater quantities to achieve any result, adds physiological injury upon anatomical insult. The patient is in the hands of a veritable habit—the purgative —and the intestine rebels against a double onslaught by a catarrhal inflammation. So, in addition to more infrequent movements, there occur pains at various times, before or during defecation, some noticeable gas, the expulsion of which gives relief from pain, and signs of mucus without and within the stool, and a chemical test may disclose

traces of occult blood. If no logical treatment is here instituted, or if the patient persists in the purgative habit, more pronounced symptoms may supervene and give a picture of the very distressing complex known as spastic constipation, which is only the pathological and physiological effect of years of mucous membrane inflamed by stagnant intestinal contents and driven by drastic purgatives. The colon suffers the brunt of the trouble, and we have all the effects of a chronic colitis, the established symptoms of an inflammation of the mucous membrane that tends to spread deeper, with more obstinate constipation, with spasm of one or more parts of the colon, and resulting pain at various times and various abdominal regions, now at the cæcal area, now at the hepatic, splenic, or sigmoidal flexures, with contraction of the colon palpable through the abdominal wall over the sigmoid, the descending colon, and even the ascending, with tenderness on pressure, general distention or local accumulations of gas, and a stool that is small and broken, containing much mucus and even streaks of blood. The general condition suffers; symptoms of auto-intoxication with weakness and headache, general neuritic pains, and large quantities of indican in the urine evidence themselves. Then the mucous glands of the colon may secrete so profusely that great masses of mucus of various shapes are evacuated and give the picture of mucous colitis or its individual fulmination, mucous colic. The small intestine may become affected so that diarrhœa alternates with constipation or even dominates, or large casts of the mucous lining of the intestine be passed. And all this is not infrequently the result of years of benign constipation made vicious by neglect or improper treatment.

Once more the problem of treatment presents itself. In the simple atonic form the indication was a mechanically stimulating diet—bulk and heavy residues the aim. But, when once a catarrhal colitis or enterocolitis with its symptoms of pain, gas, and mucus begins, the signals for a cessation of a physically irritating diet are flying, and the time for a chemically stimulating one has arrived. The intestines will no longer bear their contents and a heavy diet without inflammation, and we must give such a diet as will stimulate and at the same time soothe. The fats and oils, we know, split off mild acids which are peristaltic stimulators, sugars also yield similar acids of a gentle nature, and these food-principles should be prescribed in the form of milk, cream, olive oil, and appropriate soft fruits. Vegetables can no

longer be given whole and coarse; only such as can be eaten in purée form, as potatoes or spinach, are available; no coarse or black breads, no green salads, no cabbage, no beans of any kind, no nuts, no berries with many seeds, no hard or tough meats. The intestines must obtain as much protection as possible. The giving of a mechanical diet in constipation, when once pain has evidenced itself, is a therapeutic misdemeanor and leads only to more pain and concomitant symptoms of an established colitis that may involve not only the mucosa but the muscularis, and particularly the serosa. Pills and heavy salines are taboo, and not only physiologically interdicted, but futile, for the time comes when they have little or no effect, or else bring but mucus. Mild enemata of physiological saline or retained olive oil should be employed with the proper diet and one of the gentle salines, as Karlsbad, Vichy, Kissingen, or Homburg, for they not only help evacuate the bowels, but aid in the alleviation of the intestinal inflammation. They are to be given in only small doses, one-third of a level teaspoonful, and only in a large quantity of hot water. The kind of salt depends on the gastric chemistry—a very important consideration. In all these cases the condition of the gastric juice should be established, if possible. Much of constipation may be associated with hyperacid conditions, and even with subacid or anacid juices. It is well recognized that the long abuse of violent purgatives causes a disappearance of HCl from the stomach and leads to achylia gastrica, so that the gastric as well as the intestinal conditions demand attention. If there is hyperacidity, Karlsbad is indicated for the strong, Vichy for more delicate patients; if there is subacidity or achylia gastrica, Kissingen or Homburg is preferable. The only apparent ill-effects from these salts that the writer has noticed is an increase of pain if too large a dose is taken, and an increase in the quantity of indican in the urine under any dosage, seeming to show that the condition of the intestinal mucosa as regards the passage of fluids through its membranes has some influence on indicanuria. The pain can be controlled; the increase of indican has never seemed to augment any subjective symptoms. The use of belladonna or atropine may be of some value in allaying spasm, especially in those cases which are only a part of a general vagatonia.

The recognition of the various stages and forms of constipation and their treatment cannot be overestimated, not only by reason of the cure of the patient, but for the prevention of abdominal complications

and the proper valuation and diagnosis of abdominal pain. There are reasons to believe that many of the membranes or veils now so frequently found about the cæcum and other portions of the colon are due to chronic intestinal stasis with consequent colitis. Either the serosa is irritated by the toxins of the bacteria in the intestine, or the bacteria themselves cause subacute inflammation of the peritoneal covering and cause finer or denser adhesions which later become sterile. Bassler claims to have found an anaërobic organism, which he has called *Bacillus adhæsoformis,* in the lumen of the intestine opposite the adhesions. At times there are sudden attacks of severe pain and tenderness in the splenic region or lower in the descending colon with fever of 101° or 102°, and a moderate hyperleucocytosis, which seems to depend on an infection through some ulceration of the mucous membrane. Such attacks in this region may be confusing and lead to false diagnosis of renal lithiasis. Impaction of fæces may be of sudden symptomatic onset and cause much local and general disturbance. The conditions are often obscure and no doubt often cause misdiagnosis. In fact, with the pains in different parts of the abdomen as this or that part of the colon becomes spastic or gas accumulates, there can be little question that not infrequently diagnoses of appendicitis, gastric or duodenal ulcer, gall-stones, or cholecystitis are made, when the real trouble is due to colitis. For it must be remembered that this pain may be largely in the cæcal region, or in the hepatic, or the umbilical, or lower epigastric. The point to be remembered is that these pains may be only a part of many symptoms, that they are usually not attended by fever, high white-counts, vomiting, jaundice, hæmatemesis or melena; that they do not occur at a definite time after eating or starvation, but may be relieved by the passage of gas or fæces; there may be a history of long constipation and abuse of drugs; much mucus in the stools, a history of mucous colic; and, very important, these pains may now lodge here, now there, and may shoot across the abdomen, following the course of the colon. All these considerations should counsel us to retain in our memory the possibility that all pains in the abdomen are not appendicitis, or gastric or duodenal ulcer, or cholecystitis, or cholelithiasis, but may be due to that very common, if ignoble condition of constipation and colitis. If this contingency were borne in mind, there would be fewer mistakes in abdominal diagnosis, fewer harmful operations, and more rational medical and dietetic treatment.

ASCITES MASKED BY PERITONEAL ADHESIONS

BY A. L. BENEDICT, M.D., A.M.

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A HOUSEWIFE, aged about fifty-five, was seen in consultation with Dr. C. B. Rowell. The patient had been confined to the house, largely to bed, for some weeks. The symptoms were prostration, loss of appetite, moderate constipation and frequent vomiting, occasional slight rise of temperature. There was no jaundice, hemorrhage, gross urinary abnormality, nor anything else of significance diagnostically, and the history, even after necropsy had led to close questioning of the family, was notable only that for two or three years prior to the gradual onset of her last illness she had tended and frequently lifted her mother, who weighed over two hundred pounds.

The patient also being very fat, physical examination was not satisfactory. There were no heart murmurs; the stomach, normal in area; palpation revealed nothing; there were no superficial marks of venous obstruction, and, in regard to ascites, for which an opinion was particularly desired, all that could be said was that there was resonance low in the flanks, as well as anteriorly and over most of the abdomen; that there was no shock transmitted across the abdomen, with or without the hand used as a damper in front, and the shock from flank to flank, usually developed in ascites by the employment of auscultatory percussion, was absent. The conclusion, therefore, was that there was, at most, a very small amount of peritoneal fluid.

A consideration of the probabilities and general appearances, rather than from any definite tests, led to an opinion of general arteriosclerosis with hepatic cirrhosis.

The patient gradually failed, and died eleven weeks later, without presenting any notable symptoms or exacerbation of any particular one of those already mentioned.

At the post-mortem by Dr. Rowell, five hours after death, in my presence, *rigor mortis* was already marked. The body presented no

significant external appearances, although it seemed to me that the fat was somewhat diminished, obesity still existed, and on section the abdominal layer of fat measured about 1½ inches. Just prior to section the examination for ascites, the location of the stomach and liver, and for a possible tumor, was repeated, as well as the rigidity permitted, with the same negative results as before.

I was somewhat chagrined, therefore, to see a considerable gush of straw-colored, ascitic liquid at the first puncture of the peritoneum. Altogether, about three quarts of this liquid, without coagula, were removed.

On stretching the abdominal incision, the intestines were found matted together and forming a single mass of ellipsoid (foot-ball) shape, with the long axis perpendicular (*i. e.,* assuming the body to be in the erect posture) and considerably smaller than the drained abdominal cavity. Excepting that the regional anatomy was not followed, this intestinal mass closely resembled an enlarged model of the brain; that is, the intestinal loops were all of about the same degree of distention and projected to the proportionate degree beyond a delicate peritoneal membrane connecting them and resembling the pia mater in the sulci, with the same appearance as in the brain, of blood-vessels, especially congested veins, in the sulci. There was, at first sight, no especially distended loop of intestine, nor was there subsequently discovered any true stricture, but the colon, when dissected out, was considerably distended, though no more so than is often observed at operation or necropsy. A few fibrinous flakes adhered to the intestine.

The omentum was, at first, conspicuous by its absence. On separating the intestinal mass, it was found inverted and dipping down to the region of the cæcum, being covered over by the convoluted small intestine. Nowhere did it form a large mass.

The bladder and other pelvic organs were covered over by a fairly smooth diaphragm or roof of adhesions. One loop of small intestine was firmly adherent to this roof at about its centre, and was ruptured in the attempt at separation. Indeed, from the calibre of this loop and the appearance of penetrating the roof, it was for the moment thought that this loop was the sigmoid. The latter portion of the bowel was, however, found hidden behind the intestinal mass.

The cæcum and beginning of the ascending colon seemed at first to be of the "buried" type, but this appearance was due to their covering by a sort of peritoneal capsule of omentum. The appendix could not be found at all. Near its entrance into the cæcum, the ileum was somewhat, but not absolutely, compressed by this capsule. The ascending colon presented a small pouch, of the size of a grape—a hernia through the muscular coat.

The gall-bladder contained no calculi and was not even distended.

The liver was cirrhotic and fatty, and the serous coat was much thickened and adherent to the abdominal wall in front. It was somewhat contracted, but not enough to be diagnosed either by palpation or auscultatory percussion. It should be remembered, in practising the latter method, that what may be termed sound radiation occurs, so that, in a thick body wall, the actual area of organs is exaggerated. Allowance for this fact had previously influenced me to make the probable diagnosis of hepatic sclerosis.

Pick has associated what he terms "frosted" liver (*zuckerguss leber*) with a similar pericarditis with thickening. On account of the impossibility of performing thorough embalming and the necessity of preserving the remains as well as possible for several days, the thorax was not examined, but there had been no significant symptoms or signs incriminating the thoracic organs, except a left-sided effusion.

The spleen and kidneys were normal, and the pancreas showed no macroscopic lesion, but was badly torn in exposing it.

The stomach was of normal size and appearance, except for some softening and injection of the mucosa, probably post-mortem.

A multilocular cyst of the left ovary, and of the size of a pear, was found on tearing through the pelvic roof already mentioned.

The massing together of the intestines, so that they were held against the flanks, explains the lack of signs of ascites, since the fluid accumulated in interstices between resonant loops so there could be none of the usual gravitation to the rear, no transmitted shock, and no pool of sufficient size anywhere to afford any greater degree of dulness than might occur from solid and liquid contents within the bowel.

I must confess to be entirely unfamiliar with the existence of conditions leading to so marked and uniform matting together of

the intestines. There were no tumors, tubercles, adenopathies, or splenic enlargement to account for the diffuse development of peritoneal adhesions. The failure to find the appendix suggests, of course, a suppurative lesion in this locality, but, so far as my experience goes, such a condition would tend to pretty well localized adhesions, scarcely extending up along the anterior surface of the liver, or else to a general septic peritonitis, which, if recovered from, could scarcely be ignored in the history. The stomach, duodenum, gall-bladder, and pelvic organs were also carefully inspected in vain for vestiges of an adequate cause.

Whatever the ultimate cause the massing together of the intestines into a ball, and the formation of a roof of adhesions over the pelvic organs, the freedom from constrictions anteriorly, except the uniform cementing of the liver to the abdominal wall, and especially the absence of absolute stricture of the bowel, in spite of the numerous adhesions, formed a complex paradox.

From service on an advisory committee of the American Gastro-enterologic Association, in consultation with a general committee to secure more systematic and logical nomenclature in death certificates, the diagnosis of the present case appealed to me especially. On the one hand, it was surprising that a patient could live with such extensive lesions; on the other, it is difficult to assign an exact reason for death. The distinction between ultimate and immediate causes of death and their duration are beyond my ability. There was only moderate mechanic interference with respiration, and the heart, from physical examination, showed no notable degree of failure nor hydraulic impediment. Nutrition had been deficient for some time, and it may be asserted as a general principle, often overlooked, that the body frequently fails to utilize its stored fat as a reserve of energy. Still, with an abundant padding of fat, no gross evidence of total indigestion, and a moderate intake of food, one is not justified in assigning death to inanition. The brain, blood, and kidneys could be excluded as portals of death. The hepatic condition was serious, yet, apparently, not so extensive as to cause death, and there was no evidence of marked toxæmia, cholæmic or otherwise. In short, the case seemed to come within the category in which viability is assailed from various points and overcome by forces no one of which can be considered adequate to produce death.

Surgery

A VISIT TO THE MAYO CLINIC IN ROCHESTER, MINNESOTA

WITH THREE CASE REPORTS

BY P. G. SKILLERN, Jr., M.D.

Philadelphia

THE Mayo Clinic at Rochester is verily the Epidaurian temple of Asklepios of modern times. Owing to the extent of its organization, as well as to its various activities, it seems more advantageous to devote the present article to a general description of the Clinic, rather than to a special compilation of case-histories and operations, which may be obtained by consulting the numerous papers by the Staff. The following plan has therefore been adopted:

1. First impressions of St. Mary's Hospital and the operations.
2. The Mayo Clinic:
   - (*A*) St. Mary's Hospital.—Historical. Descriptive. Technic in Operating Room. Laboratory of Surgical Pathology. Care of Surgical Patients. Operations.
   - (*B*) Mayo Clinic Building.—General Description. Its Activities: Wednesday Evening Conferences.
3. Surgeons' Club.
4. Fellowships.
5. Mission of the Mayo Clinic.

FIRST IMPRESSIONS OF ST. MARY'S HOSPITAL AND THE OPERATIONS

Over the entrance was the legend: "St. Mary's Hospital, Conducted by Franciscan Sisters." An elevator conveyed one to the fourth floor, and a short walk through the corridor to the northeast wing led to the registration desk adjoining the coat-checking room.

After registering, an invitation was given the visitor to join the Surgeons' Club. There were blanks on the card for the name, the city, the medical school, and the date of graduation. The visitor could become either a temporary or a life member. In exchange for the outer garments a linen coat was furnished and the visitor was supplied with the day's operating list (Fig. 1). The list was divided

FIG. 1

MAYO CLINIC

LIST OF OPERATIONS

MONDAY, SEPTEMBER 28, 1914

ROOM I

Adenoma thyroid.
Total abdominal hysterectomy.
Nephrectomy. Left kidney tuberculous.

ROOM II

Appendix and gall-bladder.
Gall-bladder. Explore stomach.
Pyloric obstruction. Carcinoma?

ROOM III

Abdominal hysterectomy for fibroid.
Internal Alexander's and examine.
Duodenal ulcer.
Repair vesico-utero vaginal fistula.
Suprapubic prostatectomy.

ROOM IV

Adenomata thyroid.
Explore pelvis and appendix.
Gall-stones.
Subacute appendix.
Sterility. Dilate and Dudley operation if necessary.

ROOM V

Exophthalmic goitre. Ligation or thyroidectomy.
Double inguinal hernia.
Internal Alexander's. Appendix.
Cautery recurring epithelioma lower jaw, left.
Hemorrhoids.

ROOM VI

Iridectomy left eye.
Exophthalmic goitre. Ligation.
Hyperplastic thyroid. Thyroidectomy.
Removal tumor sternum.
Plastic operation on face.
Hemorrhoids.

into six groups, according to which of the six operating rooms they were to be performed in. There were also six transparent signs upon which were written in black crayon the operations that were in progress in each room, and the ringing of a bell announced that an operation was about to start in a certain room. Entering the first room for the first operation, which was an adenoma of the thyroid to be ablated by Dr. Charles Mayo, the reporter mounted one of the gas-pipe spectators' benches, of which there are two in one corner of the room, accommodating about twenty-five visitors. Each room is twenty feet square, with tiled floor, partly tiled walls, and white, sloping ceiling with skylight. There is an instrument table in one corner of the room and a porcelain sink along one wall. The operating table revolves upon a central pivot. Over it is suspended a large mirror

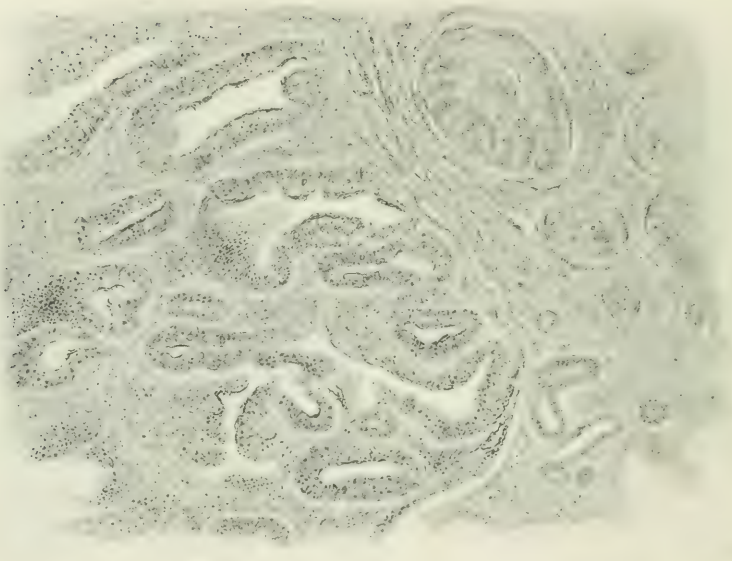
at an angle that reflects the operation field into the eyes of the spectators (Fig. 2). Over the neck of the patient is a screen, which shuts off the etherizer from the operator. Ether is administered through a mask by the drop method from the original container, the flow being regulated by a gauze held in the mouth of the can by a cork. Over the patient's legs is a tray upon which are placed the instruments and the sponges, and a pus-basin for soiled sponges. A rectangular space bounded by the edges of four towels limits the operative field in abdominal cases. At the corners of the rectangle the towels are secured to the skin by clips. After the abdominal wall is incised additional towels are fastened to the edges of the incision to protect them from trauma and to prevent infection. Each operator has two assistants—one to assist him directly, the other to supervise the instruments and sponges. Every want of the operator is anticipated, so that the only remarks he makes are running comments upon the case. The team work between operator and assistants is very striking. Simplicity of manipulations and direct accomplishment of the purpose of the operation are noticeable characteristics. At the close of the operation the final superficial suturing is left to the assistant, and the chief removes his rubber gloves and repairs to another room, where he finds another case in every readiness for the incision. Thus the first morning, from eight to one o'clock, was passed going from room to room and witnessing thirty operations. During the course of each operation the fresh pathologic specimen was demonstrated, a frozen section immediately made and examined, and the pathologic report completed within five minutes after removal of the specimen from the patient. The histologic examination of these fresh tissues exclusively by frozen section was a feature that was described to the reporter by Dr. MacCarty. As for celloidin and paraffin sections, they are extensively used, particularly in series in the subsequent examination of the tissues in the Research Laboratories in the Mayo Clinic Building.

Of the specimens removed that first morning, the reporter selected the three best, which were so beautiful that he requested his artist, Mr. Erwin F. Faber, to reproduce them in colors. One was a huge fibromyoma of the uterus, associated with carcinoma; the other a very early tuberculosis of the left kidney, and the third a rare submucous lipoma of the sigmoid. The histories and descriptions of the operations and specimens of these three cases are here presented.

Fig. 2.

Photograph of an abdominal section taken by means of the Balfour mirror suspended over the operating table at the Mayo Clinic so that the field of operation may be readily observed by those in attendance. Shows Mayo Clinic technic.

Fig. 4.



Histologic appearance of early carcinoma, associated with fibroid of uterus. (See Fig. 3.)

ABSTRACTS OF HISTORIES OF CASES FROM WHICH COLORED ILLUSTRATIONS WERE MADE FROM THE SPECIMENS IMMEDIATELY AFTER REMOVAL

CASE 1.—*Fibroid of Uterus with Early Carcinoma* (Fig. 3). Patient single, aged 50 years, complained of metrorrhagia and bearing-down sensations. Since two years menstrual periods have been irregular. Since five months there has been hemorrhage from the uterus, becoming profuse and lasting two weeks. Uterine bleeding off and on ever since, not profuse except during early stage of trouble: no odor. Since two months has had crampy pains in left iliac fossa. General health fair. Physical examination revealed a large pelvic tumor; not freely movable; very hard; slightly tender *per vaginam*. At operation a large, hard fibroid was removed, and an early carcinoma of the uterus just below the fibroid was revealed (Fig. 4).

CASE 2.—*Early Tuberculosis of Kidney* (Fig. 5). Male, farmer, aged 45 years, complained of hæmaturia. Since six months has had hæmaturia, never profuse, gradual in onset. Since three weeks has had urinary frequency, and spasm and tenesmus following each micturition. Recently has had dysuria and has passed considerable pus. General health otherwise fair. At operation a kidney, the seat of early tuberculosis, was removed (Fig. 6).

CASE 3.—*Submucous Lipoma of Sigmoid* (Fig. 7). Male, aged 54 years, complained of cramps and diarrhœa. Six years ago, for a period of two months, had alternating constipation and diarrhœa, with soreness in left iliac fossa. The diarrhœa was accompanied by blood and mucus. Five months ago began to have griping pain in lower abdomen, with sensation of obstruction in upper portion of rectum. Since two months stools have been loose, and much blood and mucus have been passed. Patient is well nourished. General physical examination negative. Skiagram reveals marked obstruction in lower sigmoid. At operation a submucuous lipoma the size of a plum was removed by intestinal resection.

USE OF THE PERCY CAUTERY IN CARCINOMA

Dr. E. S. Judd performed a radical operation upon a carcinomatous breast, using the Percy cautery for the entire dissection. In the vicinity of the neurovascular bundle in the axilla gauze dissection was employed, but the scalpel was at no time in evidence. The tissues were not charred, and the progress of the cautery was marked by a faint sizzling only. Separation of the tissues was very readily made. Among the advantages of this method are the prevention of the dissemination of cancer-cells, the blockage of the lymphatics, and the slight amount of hemorrhage.

The Percy cautery has been employed in three cases of carcinoma of the cervix uteri. In each it was applied for forty minutes, during which time an assistant's hand inside the abdomen determined the amount of heat in the uterus. In all three cases the uteri were re-

moved a month later, and thorough microscopic examination of serial sections failed to reveal cancer-cells.

The basic idea of this treatment is not cauterization, but the production and dissemination of heat in the gross primary mass of cancer. Percy [1] states that when this "cold iron" is applied to the affected tissues, not only is there much less destruction of normal cells, but a far greater penetration of heat, sufficient to kill carcinoma. Cancer is destroyed when the temperature in the mass is raised to 50° C. to 55.5° C. (122° F. to 131.9° F.); while the vitality of normal tissues is not changed until the temperature exceeds 55° C. to 60° C. (131° F. to 140° F.). The important thing is not to convert the pathology into charcoal, which inhibits the further dissemination of heat not only through the cancer mass, but beyond, and also prevents drainage for a number of days. This permits of the absorption of a larger quantity of broken-down cancer-cells than the average of these patients can tolerate; and many of them die as a result of this mistaken method of applying heat.

Thus used, the Percy cautery promises much for the future of cancer, and may revolutionize its treatment.

THE MAYO CLINIC

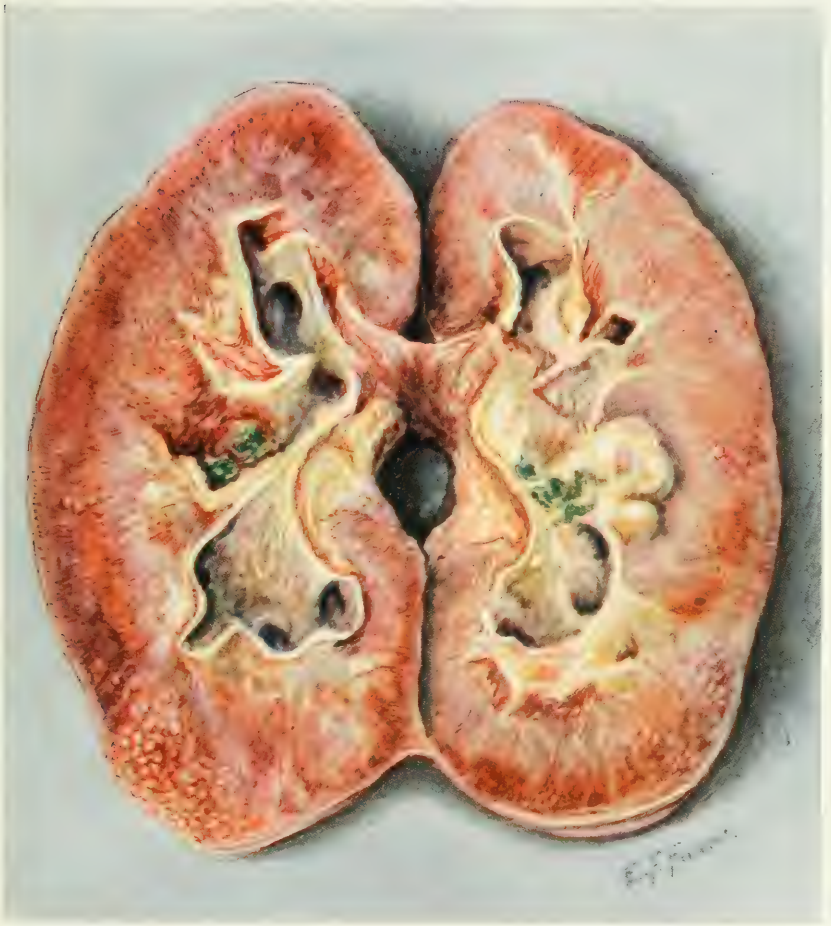
The preceding outline of first impressions expands, upon closer investigation, into a detailed description of the Mayo Clinic. The latter includes St. Mary's Hospital, where the operations are performed, and the Mayo Clinic Building, where the patients are first received and examined by all the clinical and laboratory methods and where the research work of the Staff is carried on.

ST. MARY'S HOSPITAL

St. Mary's Hospital was originally built by the Sisters of St. Francis in 1868, and incorporated in 1889. Dr. William W. Mayo, the father, was its first visiting surgeon. A new building was constructed in 1904, and another in 1909, while the third was added in 1913. The hospital was originally planned for forty-five beds, but there is now a capacity of three hundred. With the exception of twenty beds for obstetrics and medical cases under observation, it is for purely surgical cases. The location is perfect for hospital pur-

[1] *Surg., Gynec., and Obstet.*, 1914, xix, 454.

Fig. 5.



Early tuberculosis of kidney. (Slight reduction.)

poses, being sufficiently removed from the business part of the city so as to be free from its noises, dust, etc., and yet possessing all of its advantages. The grounds are spacious, consisting of fifty acres arranged into parks, lawns, orchard, and garden. The vegetables for the patients are raised here, while the milk is obtained from a herd of twenty cows. The hospital consists of six connected buildings, five stories and a basement, substantially built of brick, and has a frontage on Zumbro Street of three hundred and ten feet. Each floor is supplied with a dressing room and drug room, and a distributing kitchen with steam carving tables, gas stoves, and dish warmers to insure the serving of warm meals. All floors are connected with the main kitchen by an electric elevator. Five broad stairways connect the several floors, and three elevators, two electric and one hydraulic, run from the basement to the fifth floor for the use of patients. The floors throughout the building are doubled, with a heavy layer of felt between to guard against the transmission of noises. The hospital receives patients of every religious denomination. Absolutely no distinction is made as to nationality or creed. On the fourth floor, adjoining the six operating rooms, are large sterilizing rooms, a room for instrument cases, and surgeons' dressing rooms. Adjacent to the operating rooms are pathologic laboratories, visiting surgeons' waiting rooms, supply rooms, and waiting rooms for out-patients. The heating and ventilating systems are perfect. Steam heat is used throughout. While the main ventilation is accomplished by direct radiation, each room is supplied with fresh air by spacious windows, and ventilated by separate pipes extending to the smokestack. So excellent, indeed, is the working of this system of ventilation that the hospital is entirely free from the usual odors of such institutions.[2]

TECHNIC IN THE OPERATING ROOM

As regards the technic, the thought is that simplicity means economy,—economy in material, in the number of employees and in time. The chief factors contributing to this end are as follows:

The central thought about the institution is to get the patient well with as little loss of time as possible, and everything that cannot be shown to contribute to this end is eliminated.

[2] There is about to be added to the hospital a wing for borderland medical and surgical cases, including surgical cases that require medical observation and medical treatment not only previous to but also after operation.

The hospital is not a teaching institution, and therefore it is not necessary to be constantly educating people in the elements of surgical work.

The operating room force is the same the year around, which lessens delay and prevents waste.

The patients are brought to the operating room, placed upon the operating table, and there anæsthetized and prepared for operation at the same time, which saves from ten to twenty minutes on each operation compared with methods practised in most hospitals.

A small table which holds the instruments for each operation swings over the knees of the patient and allows the operator and his assistant to pick up the ones needed, thus doing away with the necessity of having some one to hand instruments.

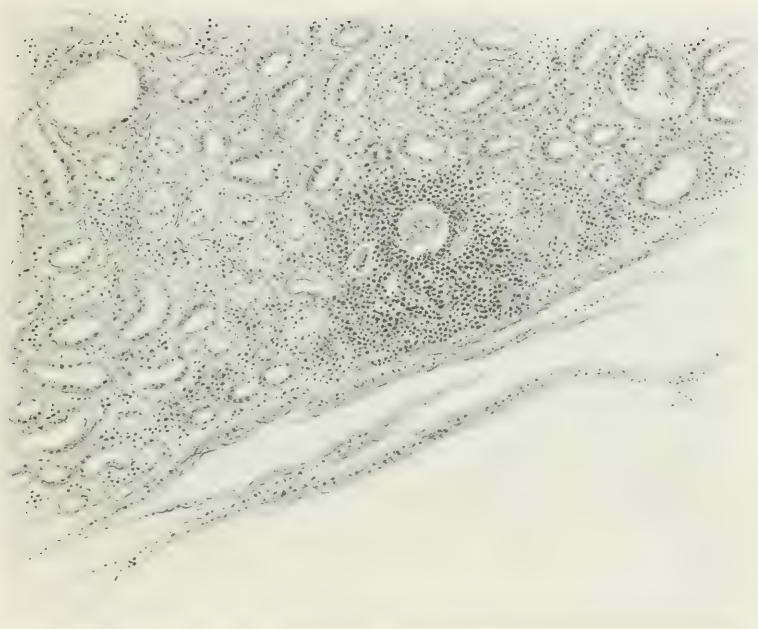
Anæsthetics are given by nurses who make this their chief business, thus saving much time. Ether is the anæsthetic of choice. Chloroform is rarely used. Nitrous oxide and oxygen anæsthesia is not employed. The ether is administered by the drop method on a chloroform mask covered with stockinet. As the patient begins to feel the effects of the ether and the anæsthetist desires to obtain a more concentrated vapor, surgeons' gauze is folded over the stockinet to any thickness desired, and the ether dropped upon this gauze. To prevent infection being conveyed from the mouth and air passages of one patient to the patient following, the hands of the anæsthetist are washed between operations, the mask sterilized, a fresh sterile piece of stockinet is placed upon it, and another fresh sterile piece of gauze is used for folding over the mask. At the end of a day's work *these pieces of stockinet and gauze are washed, sterilized, and used again.*

Preparation of Patients for Operation.—Patients requiring operations upon the stomach have the stomach washed clean with the stomach-tube and warm water before going to the operating room, and they receive a hypodermic of morphine, gr. $\frac{1}{6}$, a half hour before operation.

Patients to be operated upon for goitre or other neck operations have a hypodermic injection of morphine, gr. $\frac{1}{6}$, and atropine, gr. $\frac{1}{200}$, a half hour before operation, to prevent mucus forming in the throat, and to prevent coughing which may result from irritation to and traction upon the parts adjacent to the air passages.

When the patient comes to the operating room and lies down on

Fig. 6.



Histologic appearance of early tuberculosis of kidney. (See Fig. 5.)

the operating table, a heavy blanket is folded over the legs and extends halfway up the thighs. A wide web strap (a surcingle) is buckled about the table and over the thighs of the patient just above the knees. This prevents the patient from drawing up the knees. The patient's hands are clasped together over the chest (not the ordinary folding of the arms) and tied with gauze attached to the head of the table. The tying is done in such a way that the hands cannot be moved toward the feet, but can be moved slightly from side to side and toward the head.

At three in the afternoon of the day before operation the patients are given two ounces of castor oil. (All operations are performed in the forenoon.) They are given a light supper, and three hours later a bath. No poultice, pad or antiseptic is applied to the field of operation during the night. If satisfactory results have not been obtained from the laxative by the following morning, an enema of soap and water is given. No breakfast is allowed on the morning of operation, and the field of operation is shaved before entering the operating room. The soap used is strongly alkaline, contains pumice, and makes a generous lather in hard water. It removes grease and loosened epithelium, leaving the skin clean and smooth. At the time of operation the skin is scrubbed with benzine containing one-tenth per cent. iodine. When the skin has dried it is covered with tincture of iodine, and the patient is ready for operation. Water must not be used, as it causes swelling of the epithelium and prevents penetration of the iodine. The deeper layers of the skin will be penetrated in three minutes. This method was originated by Professor Bastiänelli, of Rome. Iodine is omitted in those thyroid cases in which preliminary arterial ligation is to be performed, since it is apt to irritate the skin and roughen it for the thyroidectomy.

Preparation of Operator and Assistants.—The hands and arms are scrubbed in running water with gauze and soap. No brush is used ordinarily. If one is used, it is only about the nails. The latter are carefully cleaned with a nail file, and the hands again scrubbed. They are rinsed in water and immersed in a 70 per cent. solution of alcohol. The head is covered with a linen skull-cap or a piece of gauze, and a face-piece is tied about the mouth of the operator and first assistant before the hands are washed. The gowns are made with short sleeves reaching halfway to the elbow. Long sleeves are

drawn on and pinned with a safety pin, and a sterile towel is pinned over the front of the gown before each operation. The gowns are not changed unless they become soiled, or unless the case has been an infected one.

Sterilization of Instruments and Gloves.—All instruments except knives are sterilized by boiling in water alkalinized with soda. All basins used for scrubbing up patients, pans, trays, glasses, and the various utensils used in the operating room are sterilized by boiling. Knives are sterilized by being kept in a 10 per cent. lysol solution. Gloves are sterilized by boiling in water. They are then immersed in a one to five thousand bichloride of mercury solution, and drawn on while in this solution.

Dressings and Packs.—All dressings, gowns, towels, pads, etc., are sterilized in the ordinary high-pressure steam sterilizer at fifteen pounds pressure. Sponges for keeping the field of operation dry are made of gauze folded so as to have no cut edges exposed, which might leave threads in the wound. When folded they are two and one-half inches square. The abdominal packs, mostly sponges four by eight inches, made of eight thicknesses of gauze, have hemmed edges and a tape six inches long sewed to one corner for anchoring. All clean, non-drainage wounds, such as clean appendix cases, hernias, and laparotomy wounds, are dressed by placing next to the wound two or three thicknesses of gauze wrung out of a one to five hundred aqueous solution of tincture of iodine. This is covered with a dry pad of gauze four to six thicknesses, and held in place with adhesive straps. No cotton or binders are ever used except in drainage cases. In the latter the gauze is wrung out of salt solution, absorbent cotton placed next to the gauze to take up moisture, and common sterilized cotton outside to distribute the moisture and prevent it soaking through into the clothing; the whole is then held in place by a binder.

Suture Materials.—No silk is used in this clinic. Instead of silk a hard-twisted, iron-black Irish linen is used. It is sterilized by boiling. Three sizes are used—25, 35, 50. Silkworm gut is sterilized by boiling eight minutes and then stored in a solution consisting of one part iodine crystals in 60 per cent. ethyl alcohol. Horse-hair is washed at intervals for several days in soap and water, soaked for twenty-four hours in a one to one thousand solution of bichloride of mercury, then boiled for three minutes (longer boiling

Fig. 7.

Submucous lipoma of the sigmoid. The upper cut shows the tumor protruding into the lumen of the opened intestine: in the lower illustration the tumor has been opened, showing its fatty nature. (Slight reduction.)

makes it brittle) and kept stored in the same solution as silkworm gut. Catgut in sizes 1, 2, and 4 is bought raw and prepared by the method of Dr. Willard Bartlett. The gut is heated far in excess of anything else used in the operating room, and consequently is sterile. If it is carefully and properly prepared it is soft, pliable, and very strong. It may be stated here that catgut is the only material used in the operation of gastrojejunostomy. No. 0 is used for the outside sutures and No. 1 for the inside. Silk and linen are apt to conduct infection along the suture lines, thus causing a collar-like induration of inflammatory tissue. The ends are apt to dangle in the osteum and cause trouble. New ulcers are thus predisposed to.

Drainage Tubes.—Straight and curved glass tubes of different sizes are used in the pelvis in cases of diffuse peritonitis or in a large abscess cavity. A strip of selvage-edged tape runs through the tube, and a large moist dressing covers and surrounds the projecting ends of the tube. The dressing is kept moist with sterile water or normal saline to promote capillary drainage. These tubes are removed in from twenty-four to forty-eight hours and replaced by a split rubber tube if there is much drainage. Rubber tubing with a longitudinal split enclosing a strip of selvage-edged tape is used in the abdomen for draining abscess cavities, or any place where much discharge is expected. The tape is removed the second or third day, and, beginning the third day, the tube is gradually shortened until it is finally removed, often on the fifth day, and always by the end of a week. In small cavities or places where a small amount of infection may take place in the abdomen, a cigarette drain or one or two small drains made by rolling up a sheet of gutta-percha tissue are used. Gauze in any quantity is never used as a drain in the abdomen, but a small amount is used sometimes to control hemorrhage by being packed against an oozing surface. This is removed as soon as it has served its purpose of aiding clotting. In draining cavities outside of the abdomen, such as result after radical breast operations, removal of inflamed lymph-nodes in the neck, or goitres, a rubber tube cut spirally by revolving it on its long axis while cutting is used with a piece of selvage-edged tape in the lumen. The tape is removed in twenty-four hours, and the tube on the second or third day.

Most of the information on operating room technic has been obtained from an article on that subject by Dr. E. H. Beckman.

THE LABORATORY OF SURGICAL PATHOLOGY

One of the most efficient departments of the Clinic, and one that displays real team work, is the laboratory department, of which Dr. Louis B. Wilson is chief. Being particularly interested in this subject, the reporter spent much time there, and is deeply indebted to Dr. William Carpenter MacCarty, who is in direct charge of the Hospital division of the laboratory department, and his assistant Dr. Broders, who in the absence of Dr. Wilson courteously extended to him the freedom of *entrée* and put at his disposal the beautiful specimens from which the colored illustrations were made.

As soon as tissue is removed at operation a bell summons an assistant in pathology, who calls for the specimen, takes it to the laboratory, *immediately* examines it both grossly and microscopically by frozen sections, and *immediately* returns it for inspection of the operator and for demonstration to the spectators. All specimens are photographed, and are shown to relatives of the patient operated upon. This fresh-tissue diagnosis is a special feature, and a detailed description is presented from a paper by Dr. Wilson.

To the surgeon at operation the questions arise: Is the tumor cancer? Is it sarcoma? Is it tuberculosis or other infection? These questions may be answered *within five minutes,* if the evidence is within the tissue submitted, by examination of frozen sections of the fresh tissue stained with polychrome methylene blue. This is the only dyestuff which stains intensely and with good differentiation chromatin and cytoplasm in contrasted colors at the same time, while the tissue is still alive. Good photomicrographs may be made directly from slides prepared in this manner. The technic is as follows:

1. Fresh tissue, the cells of which must be still alive (*i.e.,* if not kept in the ice chest, not more than two hours out of the body), in bits not more than 2 x 10 x 10 mm. is frozen in dextrine solution on a good microtome and cut in sections 5 to 15 microns thick.

2. Remove the sections from the knife with the tip of the finger and allow them to thaw thereon, thus avoiding later development of air bubbles.

3. Unroll the sections with camel's-hair brush in 1 per cent. NaCl solution.

FIG. 8.

A convalescent home.

Fig. 9.

The Mayo Clinic Building.

4. Stain 10 to 20 seconds in Unna's polychrome methylene blue, Grubler's.

5. Wash out momentarily in 1 per cent. NaCl solution.

6. Mount in Brunn's glucose medium. (See Lee's "Vade Mecum.")

The Spencer automatic microtome with CO_2 attachment and vulcanite insulating plate gives excellent sections. Handle the sections from first salt solution through to the slide with a small glass rod-lifter. Keep the sections constantly moving while in the stain. The smaller the stain cup the more readily tissue may be found in it if dropped from the lifter. If fluids for unstained sections are in clear glass over a black background, and those for stained sections are in white porcelain or clear glass over a white background, the work will be much facilitated. The various tissue elements are sharply contrasted in red, purple, and dark blue. Even mitotic figures, where present, are many times beautifully shown. The sections, of course, fade as they die and decompose. Formaldehyde-fixed material, first thoroughly washed in tap water, may be treated in exactly the same manner as fresh tissue. The color differentiation is materially different, but the process is of great convenience for the rapid examination of a great number of blocks from a given specimen.[3]

CARE OF SURGICAL PATIENTS BEFORE, DURING, AND AFTER OPERATION

Operative results are so influenced by the care of surgical patients that the one reflects directly the efficacy of the other. A good idea of the methods in vogue at St. Mary's Hospital may be obtained from the paper by Dr. Donald C. Balfour, of the Mayo Clinic.

Following the operations, and as soon as is compatible with safety, the patients are transferred to the various sanatoria or boarding-houses to continue their convalescence (Fig. 8). It is a familiar sight to see patients walking about town with their dressings on. Out in the hotels and various places one hundred and fifty patients are constantly awaiting an expected bed in the hospital.

Care before Operation.—The afternoon previous to the day of operation give two ounces of castor oil in beer, and follow by a

[3] *Jour. A. M. A.*, December 2, 1905.

light evening meal. A tub bath should be given and the field of operation shaved. In the morning thoroughly evacuate the lower bowel and rectum.

In extremely obese persons in whom a radical operation for hernia is to be done it is advantageous to decrease the weight as much as possible by judicious dieting. Groups of cases that require special care are:

1. Exophthalmic goitres in which the disease is in an acute stage. The operative risk is prohibitive in these cases. There must be absolute physical and mental rest, and infusion of digitalis should be given as a cardiac corrective. In the toxic non-exophthalmic type of goitre the chief lesions are of the heart and kidneys, and this group exhibits the heaviest mortality following operation. A laxative should not be given because of susceptibility to gastro-intestinal disturbance. About 45 minutes before operation $\frac{1}{6}$ grain of morphine, with $\frac{1}{120}$ grain of atropine and $\frac{1}{200}$ grain of scopolamine, should be given, the combination of which limits the secretion of mucus and stupefies the majority of patients.

2. Prostate cases require preliminary drainage of the bladder to clear up the urine, maintain the specific gravity, and diminish the blood-pressure.

3. Severe secondary anæmias are given large doses of iron, forced feeding, and occasionally transfusion.

4. In cases of deep, transitory jaundice operation should be postponed until it has cleared up. Calcium salts and horse serum are of doubtful value.

5. Emaciated patients, especially those with pyloric obstruction, can often be greatly improved in the course of a few days by increasing the body fluids. The stomach should be washed the morning of the operation.

6. Certain cases with acute infections are benefited by careful pre-operative watchfulness, especially when the patient's illness is due to a general toxæmia and not to some focus of disease.

7. Morphine and atropine are given in gastric and rectal cases, in recent infections of the lung, to very fleshy individuals, to alcoholics, and occasionally to patients with heart lesions with whom local anæsthesia is to be used.

Care during Operation.—Careful exploration, a not unduly prolonged operation, maintaining bodily heat, as little manipulation as possible, no more retraction of wound than is necessary to expose the parts, accurate hæmostasis, and a precise toilet to complete the operation, lessen the possibilities of postoperative complications.

Care after Operation.—Patients with toxic goitre require fluids after operation, and for those with mental restlessness or cardiac irritability ice to the head and præcordium are of service. Drainage for twenty-four hours is essential. Acute hyperthyroidism after operation for exophthalmic goitre is serious, terminating in death or recovery within twelve to forty-eight hours.

Stomach and duodenal cases should be placed in the sitting position immediately after operation. Feeding should be gradual, beginning with small quantities of hot water after the first few hours, and the next day weak tea, broth, or albumin may be added, increasing until about the time the patient leaves the hospital, when a full diet is allowed. Oozing is combated by gastric lavage with small quantities of hot water.

Prostatectomies require close attention to the drainage during the first twenty-four hours, lest the catheter become plugged with clots. They are gotten up as soon as the drainage is removed.

Treatment of common symptoms and complications during convalescence include:

Vomiting.—Persistent vomiting is relieved at times by an enema which sets up a peristaltic action in the intestines and a passage of gas. Lavage with two or three glassfuls of warm water may suffice. In other cases tubal lavage is necessary, while in cases of dilatation nothing but systematic lavage every few hours will avail. A useful adjunct in these cases of acute dilatation is to have the patient lie prone in bed with a pillow under the hips.

Thirst.—Fluid *per rectum* has diminished the frequency of postoperative thirst. As soon as the vomiting from anæsthesia has subsided, water may be cautiously given by mouth and gradually increased.

Gas.—This may be combated by rectal tube and enema. Milk and molasses is a satisfactory combination for marked rectal irritation.

Mucus.—A simple expedient of aiding the patient to rid himself

of mucus in the respiratory tract is to hold him upright in bed, firmly supporting the abdomen by encircling his waist from behind.

Inability to Urinate.—Voluntary urination should be encouraged by getting the patient out on the side of the bed after certain operations, such as goitres and laparotomies with small incisions. The use of the catheter should be limited, since there is always a chance of infection.

Paresis.—Mild paresis is best relieved by enemata. In the more prolonged types judgment is required in deciding for or against operation. An ounce or two of castor oil administered through the stomach-tube after washing out the stomach quickly settles the question of the patient's overcoming the obstruction. If operation is necessary, enterostomy under local anæsthesia is the method of choice, and a modified Witzel method is best.

Pulmonary Complications.—An acute condition which closely simulates pneumonia is perhaps the most common complication of the lung. This usually begins on the second day following operation with an onset suggesting pneumonia, and with the congestion of an early lobar pneumonia. This condition is maintained for two, three, or four days, without developing further than the primary stage of a true pneumonia, and then is suddenly terminated by a crisis. The essential treatment is to keep up the bodily heat of the patient, giving him all the fresh air available. Even in the coldest weather the patient may be placed in front of an open window.

Renal Insufficiency.—The urine voided must be accurately measured, and if signs of failing secretion arise, fluids should be increased and, if necessary, sparteine sulphate given, three grains every three hours. In cases of total suppression, decapsulation of the kidneys has been done, with relief in some.

Postoperative Hemorrhage.—Deeply jaundiced cases are treacherous, the combination of the slow coagulation time with the peculiar changes in the vessels themselves making secondary oozing very likely. In a few cases transfusion has benefited, while horse serum is of questionable value.

Shock.—Saline solution subcutaneously, morphine, and camphorated oil every two or three hours are indicated in true postoperative shock. But slight benefits are derived from blocking periph-

eral nerves encountered at operation, and the method is of practical value in a small group of cases only.

Postural Drainage.—In acute abdominal conditions postural drainage plays a very important part in the patient's recovery. For example, after operation for perforative appendicitis the patient should be kept upright in bed and lying to the extreme right side. In such cases drainage is rendered more efficient by frequent changes of the wet dressing.

Phlebitis.—Femoral or saphenous phlebitis, which usually sets in about the tenth day, is not amenable to treatment other than absolute rest and local heat.

Embolism.—Impossible to obviate and to treat, embolism is one of the bugbears of surgery. Undoubtedly there are patients who recover permanently from pulmonary embolism, and patients may live several hours and then succumb to an attack.

Advice to Patients.—It is of importance to explain to convalescents how to take proper care of themselves and what symptoms to expect after dismissal from hospital. Judicious living should continue for several months according to the type of operation.[4]

THE OPERATIONS

The operations proceed quietly, smoothly, rapidly but not hastily, and without the slightest hitch. Of the surgeons present during the reporter's visit there were Doctors Mayo, Judd, Beckman, Henderson, and Fisher. Dr. Balfour was out of town. Dr. William Mayo is at once seen to be a master technician. He prefers the abdomen to any other portion of the body. Dr. Charles Mayo is a most skilful and versatile surgeon, operating with equal facility on every part of the body. A great European surgeon, witnessing his operations, said: "He has the soul and the hand of the artist." Dr. Judd is a rapid operator, always certain of his ground, and it is a pleasure to watch his accurate manipulations. He prefers goitre and breast operations, as well as prostatectomies. Dr. Beckman's hobby is operations upon the head, neck, and spinal cord. The reporter saw him make alcoholic injections of the second and third divisions of the trigeminus. Dr. Henderson performed some very interesting bone operations. Dr. Carl Fisher operated upon the eye. His work showed an exceptional amount of skill. Among the operations done

[4] Donald C. Balfour, *Medical Record*, February 28, 1914.

by him were iridectomy, cataract, secondary glaucoma, pterygium, and eviscerations. Throat operations are performed by Dr. Donald C. Balfour.

During the year 1913 there were operated upon 8478 patients, with a total number of 10,166 operations. The total death-rate was 1.5 per cent. The total number of abdominal operations was 4764, and the total abdominal death-rate 2.3 per cent. The total intraperitoneal death-rate was 2.5 per cent., and the total intraperitoneal non-malignant death-rate 1.8 per cent.

THE MAYO CLINIC BUILDING [5]

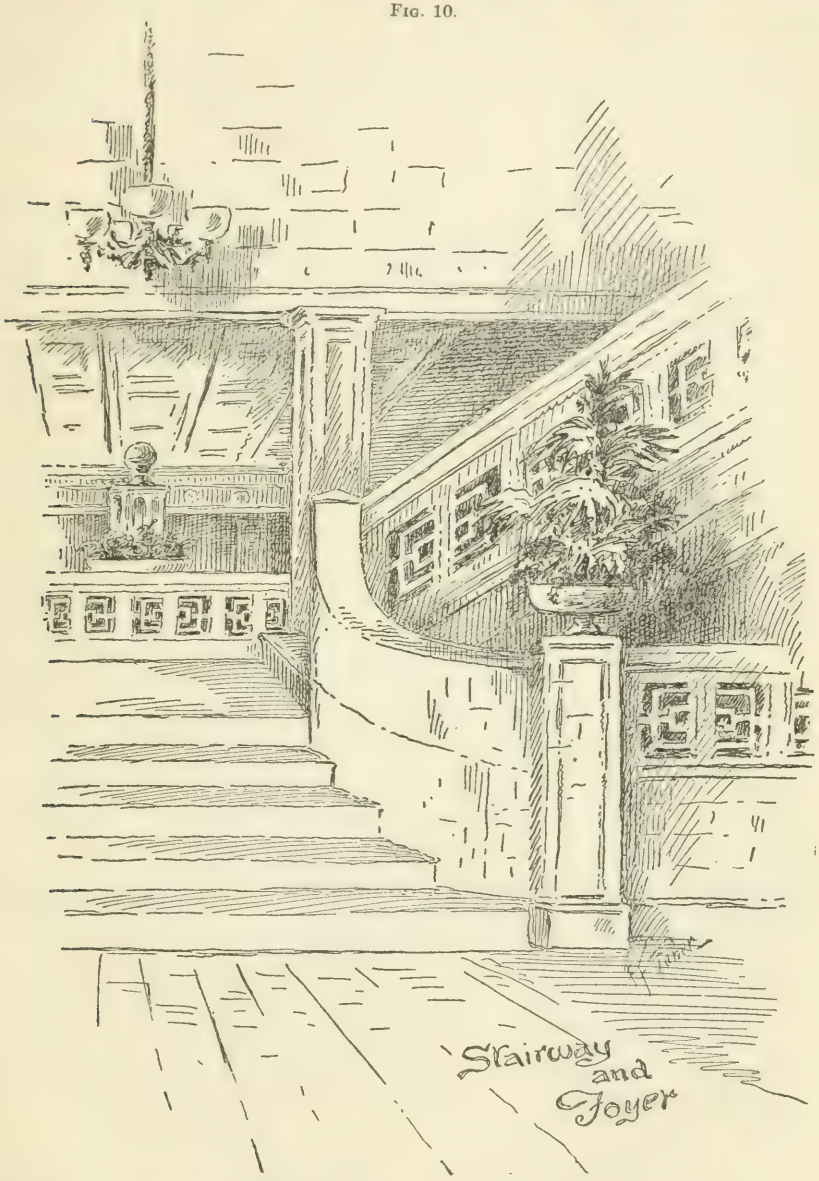
The Mayo Clinic Building, in Medical Block, immediately adjoining the Hotel Zumbro, has been recently described by Dr. Richard Olding Beard, secretary of the Medical School, University of Minnesota,[6] whose description will be largely drawn upon. One approaches a large, handsome, five-story brick building faced with marble (Fig. 9). The main entrance is flanked by two smaller ones, that on the left leading into an inclined way for rolling-chairs, and that on the right leading into the porter's room, where hand-baggage is checked. Over the main entrance the words "MAYO CLINIC" are cut into the stone. On opening one of a pair of heavy brass screen doors, one enters the front-entrance hall directly opposite to where a broad tile staircase extends to the upper floors, dividing into right and left stairways upon a wide platform (Fig. 10) overlooking the open square, which reminds one of nothing so much as the Greek agora. This general waiting-room (Fig. 11) forms a quadrangle in the entire centre of the building, and is lighted by a wide well from skylights. Its furnishings consist of an attractive playing fountain in the centre, numerous leather-bottomed basket chairs for the accommodation of patients, and potted palms from the conservatory, which is on the roof of the building. The waiting-room is in charge of attendants occupying desks at the four corners of the space. In the corner to the right of the entrance are ample quarters for the registrars, the clerical force, and the correspondence corps. The record system under which they operate is as perfect as that of the statistical bureau.

[5] The reporter is indebted to Dr. Harold T. Foss, of the Mayo Staff, for his courtesy in conducting him through the building.

[6] *Journal-Lancet*, August 15, 1914.

Flanking the agora upon three sides are private corridors, giving entrance to a double row of examination and consulting

FIG. 10.



rooms occupied by the members of the clinical staff and to a clinical laboratory. Here the strictly investigative work upon the patient is

carried on, the entire equipment lending itself to diagnostic inquiry of every sort. A system of colored signal-lights, ranged along the corridors, announces the presence and whereabouts of each leading clinician. A check upon his attendance and location is also kept at a central information bureau, in which he registers upon entry. The bureau clerks, through a system of signals and telephonic communications, keep touch upon his movements, and locate him upon occasion.

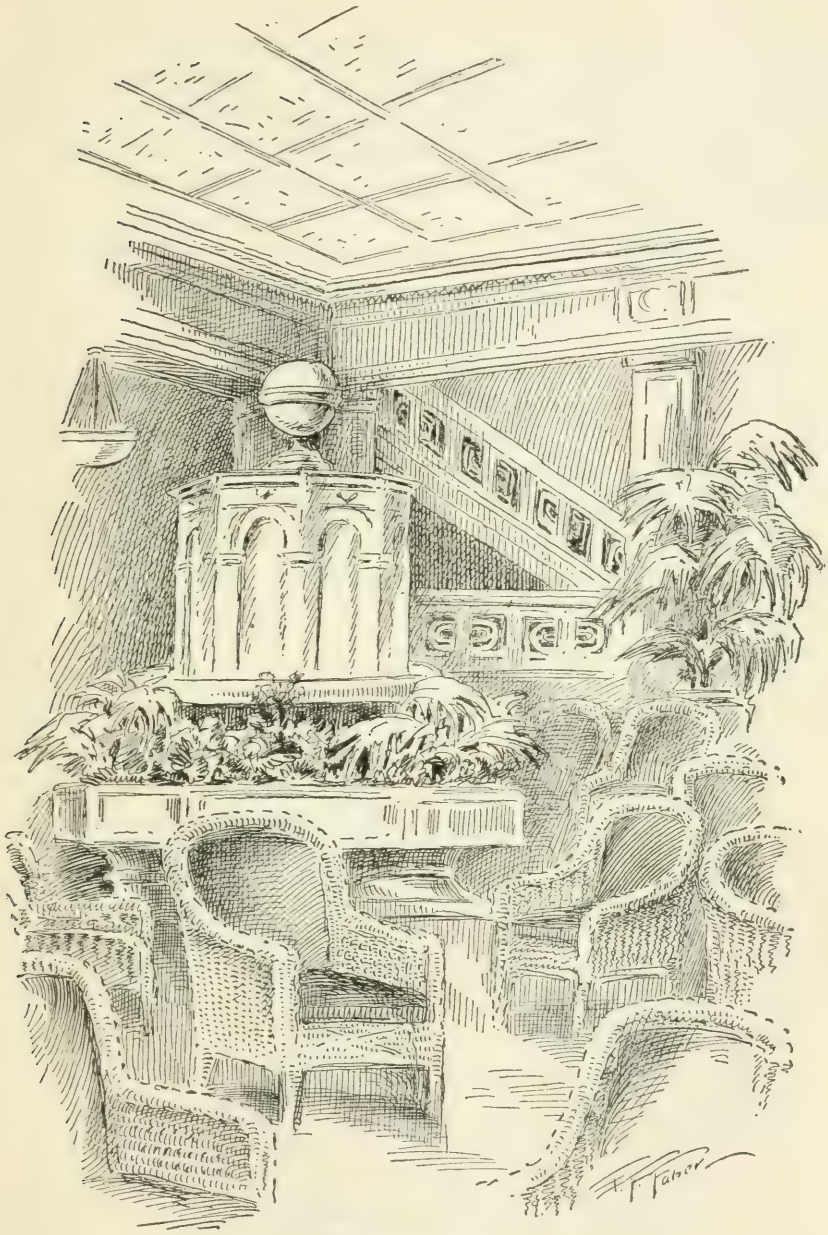
The second floor is about equally divided between the clinical service, along special lines, and laboratory research. Clinics in eye, ear, nose, and throat disorders and in genito-urinary diseases are conducted here. The corridors adjoining the consultation rooms, lined with chairs, are utilized as waiting-places, and in them clerks are stationed at suitable vantage points. Adjoining the clinical offices are laboratories devoted to experimental medicine, bacteriology, and parasitology.

A series of rooms is occuped by the cystoscopic and proctoscopic clinic, in which treatment is a matter secondary to diagnostic investigation, and which serves, in this relation, the major surgical clinic as a whole. The equipment of these rooms is wonderfully complete and includes a special X-ray laboratory. Over three thousand cystoscopic and proctoscopic examinations were made within the past year. The X-ray laboratory, to which an entire wing is devoted, is divided into some thirty-four rooms, in which diagnosis and research play the larger and therapeutics the lesser part. The outfitting of this laboratory is an object lesson in röntgenology, to which operators, teachers, and students may well repair. In the demonstration rooms there are about seventy feet of illuminated widows for the study of X-ray plates. There are more than twenty thousand plates exactly classified with the history of each ailment.

Upon the third floor the purely scientific and literary level of the Clinic is reached. The one entire wing is occupied by the Research Laboratory Division, and the other wing and the centre by the Editorial Department. All patients are treated below the third floor.

The Research Laboratory Department, with its headquarters on this floor, is an essentially going concern. It does not represent the accumulations of the past,—the museum products of its finished

Fig. 11.



The waiting-room.

labors, which are found upon the floor above,—but the active investigations, the live researches of the present. Here are the laboratories of histology, pure pathology, photomicrography, and physiologic and pathologic chemistry. It provides room not only for the staff, but for graduate-workers of two classes: voluntary investigators and research Fellows for whom the Clinic provides an annual stipend, both serving under the supervision and direction of the heads of departments.

The Editorial Department embodies and controls the literary opportunities of the Clinic. In the centre of the building are found the offices of the editor, Mrs. M. H. Mellish, and her staff; and flanking them and extending into the wing are the artists' studio, the illustration room, the reprint library and exchange, the library of current periodicals, the reading and smoking rooms, and a handsomely furnished assembly room, in which staff conferences and meetings of staff organizations are held.

The library has some four thousand volumes, put to reference and circulatory uses, in addition to large files or reprints and monographs. Its bibliographic service is maintained by the editorial staff, and extends beyond the confines of its own shelves. In addition to its current literary service the Clinic publishes an annual volume of scientific papers. The volume of 1913 contained over eight hundred pages.

The fourth floor may be said to house the scientific service rooms of the Clinic. Pathologic preparation laboratory, classified pathologic museums, the photographic gallery and photo-developing rooms, the X-ray plate rooms and the X-ray machinery shop, the drafting rooms, and the workshops, including manufacturing, repair, and electroplating rooms, are the several utilities it shelters.

Finally, a roof-house crowns the building, and crowns it not only in structural but also in scientific and æsthetic features. It is built so far within the area limits of the building below as to permit of a wide open-air corridor surrounding it on all sides. A series of animal houses and enclosures, store-rooms, an anatomical specimen shop, an X-ray experiment room, an animal experimentation laboratory, including sterilizing, anæsthetizing, operating, and recovery rooms, set forth its scientific conveniences. There are also a set of dressing rooms, toilet rooms, bath-rooms, and a floral conservatory.

The interior of the building is finished in fawn-colored Rookwood tile. The stairways and balusters are of the same material. No better illustration of the harnessing of electricity to man's purposes may be had than in this building. Electric elevators, electric clocks, and a specially devised telephone system are among the many features. The electric illumination is by the indirect system.

The system of filing histories is remarkable for its coördination, and may be termed the central nervous system of the organization of the building.

THE WEDNESDAY EVENING CONFERENCES

Every Wednesday evening at eight o'clock the entire staff of seventy meets in the assembly room on the third floor. This is a large, spacious room with luxurious appointments. Above the fireplace, which is opposite the entrance, is a tablet of acknowledgment to Dr. Henry S. Plummer, whose genius and labor resulted in the completion of this marvellous edifice. On the left side of the fireplace is a portrait of Dr. William J. Mayo, and on the right is one of Dr. Charles H. Mayo. There are enough leather-upholstered chairs to accommodate the staff. The lighting is indirect, from four artistic electroliers suspended by brass chains from the ceiling. At these conferences, to which a few visiting surgeons are invited, some members present the results of their study-trips to other clinics, and others read important abstracts from the literature. The members of the staff enter into a general discussion. The evening the reporter attended the most interesting subject was an abstract of a paper by Armstrong, of Montreal, upon leather-bottle stomach, or *linitis plastica,* and its relation to carcinoma. Dr. William J. Mayo discussed this subject at some length. He incidentally referred to a type of syphilis of the stomach in which multiple ulcers that resembled the gills of fish were present. He and Dr. MacCarty both believed that most cases of linitis plastica are carcinomatous although the cancer-cells might be found only after a thorough microscopic study of the entire organ.

Exclusive of the medical staff, there are one hundred and sixty employees in the Mayo Clinic Building. This number also represents the daily average attendance of patients from all parts of the Union.

THE SURGEONS' CLUB

The Surgeons' Club is an organization made up of and wholly controlled by the visiting surgeons. The club meets every afternoon at three o'clock in the Y. M. C. A. Building, second floor front. Reporters who have been assigned to the morning clinic present comments upon the more interesting cases, and a general discussion follows. The reporter was invited to give a talk upon "Local Anæsthesia, with Special Reference to Nerve-blocking," and a very able discussion followed. At five a member of the staff usually gives an address. In the evening the club meets in the annex adjoining the Mayo Clinic Building, formerly used as the Clinic Library. This is a substantial one-story edifice, and the approach to it is a beautiful piece of landscape gardening (Fig. 12). Within the building is a lecture room, equipped with a screen and projecting lantern.

THE DOCTORS MAYO

Nagel in his "Professional Journey Pictures in America," Tuffier, Pozzi, Faure, and other distinguished surgeons of world fame have so eulogized the Doctors Mayo that it would be folly for the reporter to add anything more.

THE FELLOWSHIPS

In 1913 fellowships were established to form a basis for graduate instruction of the University of Minnesota. Every six months four Fellows are elected to serve as internes for a period of three years. The first year is spent in the hospital or laboratory. The second year is spent in alternate departments. The first is ten months in the operating room, which may be extended by substituting, and two months on the medical side of the hospital. In the afternoons dressings and ordinary interne work are performed. The second is in the research laboratory of pathology, where the interne assists at all autopsies and takes up research work under the supervision of the director. The third year is passed in the clinical division, where the interne writes histories under direction of the chiefs, and makes detailed studies in clinical work. On the basis of university fellowships these are salaried positions, the sums amounting to six, nine, and twelve hundred dollars, respectively. In addition to this, research work by outsiders is encouraged along special lines, especially surgical pathology.

Fig. 12.

The Mayo Clinic Annex.

The number of postmortems obtained in proportion to the number of deaths is remarkable. Thus, out of the last sixty-two deaths, sixty autopsies were performed. The friends are told what is found. Nowadays laymen expect to know the truth, and are suspicious of physicians who do not tell.

THE MISSION OF THE MAYO CLINIC

As Beard states, public and profession alike realize that the function of the physician has become a social one, and carries with it social obligations: first, to bring to its *clientèle,* at reasonable cost, the utmost resources of medical knowledge and technical skill; second, to add something, by way of the discovery of new truth, or of new applications of old truth, or of new conclusions based upon accepted data, to this fund of scientific knowledge and this exercise of special skill; and, third, to lay this contribution of progress at the feet of the teachers and students of medicine for the benefit of coming generations.

The success of the Mayo Clinic has demonstrated the large values of professional combination, as against the methods of professional competition. It is an open question whether modern tendencies toward the socialization of medicine, tendencies which go along with the socialization of other essential utilities, may not be timely and wisely met by this sort of concentration of men and means, by this form of coöperative effort in the health-service of the people.

That the Doctors Mayo are actuated by altruistic and broad humanitarian motives is impressed upon anyone who has an opportunity of interviewing them.

"The Utopianism of our profession is too idealistic for ready comprehension in this commercial age. The time has come for the public to be taken into our confidence; if we wish better results, we must enlighten the people, for with them lies the final word.

"In the past charity cases have received the best medical treatment, because the services of medical men, including specialists, have been freely available for them. The wealthy are subjected only to the limitations imposed by themselves. But it is for the people that make up the backbone of the country, those within moderate circumstances, that the resources of modern medicine should be more

available than in the past. Heretofore this self-respecting and worthy class could probably afford the services of one physician, but of no specialists. Because of their financial status they have, for economic reasons, been subjected to mediocre professional attention. Before the eyes of the profession all sick persons, rich or poor, should be equal, and alike should receive the best medical attention and services. There should be no discrimination."

That this ideal has been attained in the Mayo Clinic is shown by the fact that no questions regarding the financial status of their *clientèle* are asked until after the patient has been examined and treated by operation or other means, and then only by the financial department. It turns out that only forty-five per cent. of patients pay more than expenses.

The Doctors Mayo are the guardians of a great trust; they are trustees of the Mayo Clinic. They are training a modern school of surgeons who shall not only continue their work, but also become leaders of surgical thought.

Perhaps Dr. William J. Mayo was not conscious of expressing his own feelings when, in the President's address before the American Medical Association in 1906, he said: "To realize that one has devoted himself to the most holy of all callings, that without thought of reward he has alleviated the sufferings of the sick and added to the length and usefulness of human life, is a source of satisfaction money cannot buy."

PERINEPHRITIC ABSCESS COMPLICATING THE POSTPARTUM

BY PIERRE GAUTRON, M.D.

Tours, France

Perinephritic abscess as a complication of the postpartum is uncommon, but, as cases do turn up from time to time, it is well for the urologist to be familiar with this possibility. The symptoms presented are of two kinds, *viz.*, the general and the local. The former consist of a rise of temperature, a poor general condition, rapid pulse, and loss of weight and strength. The local symptoms are pain and tumefaction in the lumbar region.

The fever is high, remittent, but continued; it is the high fever with marked oscillations of all-important suppurating processes. The patients observed by Horseley and Legneu ran a temperature of 39.6° C.; in those cases reported by Faugère and Charrier it never went above 37.6°. This fact seems difficult to explain, although some writers have pointed out that in very weak patients a perinephritic abscess can undergo its evolution with a nearly normal temperature. But such was not the case with one of the women whose general condition was rather satisfactory than otherwise. This is simply a fact that must be noted without trying to explain it by hypotheses without value, but it nevertheless remains true that a high temperature should be considered as an important symptom which is hardly ever wanting.

The pulse is rapid, full, and strong, the number of the beats following the thermic rise.

The pain is also one of the cardinal symptoms of this lesion. It may be more or less intense, taking on most varied forms, but it is never absent. It usually comes on early in the process, often one or two weeks before the other symptoms. Usually located in the lumbar region, it frequently shoots off to some distance, and the intensity of the distant pain may lead the surgeon astray in his appreciation of the real starting point. These painful radiations are due to irritation of the nerves which run behind the kidney and, therefore, are in direct contact with the inflamed tissues; those particularly involved

are the twelfth intercostal and the large and small abdominogenital nerves. Two of Horseley's patients complained of pain in the hip, while the third located the pain at the iliac crest. In the cases reported by Legneu, Lepage, and Convelaire the pain was lumbar, with rather weak radiations. In one of Horseley's cases it extended to the thigh, and in Faugère and Charrier's case it extended towards the iliac fossa and thigh,—that is to say, following the direction of the psoas muscle.

The latter form of pain should be remembered, because it often produces a characteristic attitude of the corresponding lower limb, and this existed in the patient in question. The patient keeps the thigh flexed on the pelvis with external or slight internal rotation, which may very well lead to an erroneous diagnosis of coxalgia or psoïtis. The pain is dull and lancinating or acute and paroxysmal with the characteristic shooting. It is always increased by pressure over the lumbar region, and especially by bimanual palpation of the costo-iliac space. It may become so violent that examination is quite impossible without an anæsthetic.

The early appearance of the pain is, for that matter, a general occurrence in the symptomatology of perinephritic abscess, and Gibney, who has tried to discover the signs permitting one to detect the lesion in its early stage, attributes considerable value to it. He says that when, after a violent muscular effort like that of labor, there is tenderness on pressure over the kidney, or when the patient, seated or standing, bends towards the diseased side, the possibility of a perinephritic abscess should be at once thought of. This leads one to refer to a certain number of little signs which are not well known but have been well described by Gibney, and will lead one to make a diagnosis of perinephritic abscess, or at least to suspect its presence, before swelling in the lumbar region is manifest.

The spine is abnormally rigid and shows an anteroposterior curve. This curve is not angular, and it may present a slight deviation to the diseased side. When walking the subject carries himself stiffly, with the body inclined to the diseased side in such a way that sometimes the ribs and iliac crest come in contact. Bending of the body is difficult. When the patient is lying down it is impossible for him to extend the thigh. In serious cases any movement of the body is painful. Bending the thigh is not painful, but an endeavor to extend it completely will be unsuccessful and produce pain. Abduction and adduction are not usually hindered in marked extension.

At a more advanced period of the affection the presence of a tumefaction in the lumbar fossa becomes manifest. There is, first, disappearance of the costo-iliac concavity, a phenomenon easily discovered when one looks at the patient from the front and compares it with the other side. But when the swelling increases there is apparent tumefaction in the lumbar and costo-iliac spaces.

By bimanual palpation there is a sensation of fulness in the lumbar fossa, the result of a diffuse tumefaction which does not follow the movements of respiration, nor does it present the phenomenon of renal *ballottement*. This tumefaction, which in the beginning is hard and remittent, gives rise later on to a sensation of deep fluctuation when pus has formed Quite often, in the advanced stage, there are phenomena of reaction in the skin, which becomes red, hot, and œdematous, a sign that some writers consider as pathognomonic. In no case with which I am familiar were there any marked gastro-intestinal disturbances, such as profuse diarrhœa or severe vomiting that have been described as occurring in perirenal abscess. There has been only loss of appetite and almost constantly a rather obstinate constipation. In making his remarks on the three cases observed by him, Horseley insists on this latter symptom. Its pathogenesis would seem to be due to a paralysis of the colon, whose contact with the inflamed tissues is often intimate.

Urine is passed in small amount, is highly colored, poor in chlorides, and contains neither albumin nor pus, excepting when the abscess is secondary to a pyelonephritis.

The exact location of these abscesses is a much-discussed question. They develop around the kidney, outside of the fibrous capsule of the renal gland, and within the aponeurotic space formed by Zuckerkandl's fascia. The abscess is nearly always unilocular, the kidney forming one of its walls, usually the anterior, while the neighboring viscera, the diaphragm, quadratus lumborum, psoas, colon, spleen, liver, contribute to the formation of the walls of the abscess.

The shape and relationship of the abscess vary according to the region in which it develops, and Maas has, to my mind, given the best classification, in which four varieties are distinguished: (1) Suprarenal or subphrenic abscess, which is in relation with the lumbar portion of the diaphragm, the liver on the right, on the left the spleen, and the pleura by means of the costodiaphragmatic hiatus. These anatomical relations explain the ordinary outcome of these

abscesses, which is extension to the thoracic cavity and the exit of the pus by eruption into the bronchæ. (2) Infrarenal abscess, limited in front by the prerenal layer, the peritoneum, and colon, behind by the sacrolumbar mass. On account of the absence of the fascial capsule this abscess easily works down into the iliac fossa, the ischiorectal fossa, the upper part of the thigh, and sciatic notch. In direct relation with the psoas, this abscess may, like that of Pott's disease, penetrate the sheath of the muscle and project under Poupart's ligament at Scarpa's triangle. (3) Prerenal abscess, limited in front by the prerenal peritoneum. This form is uncommon. (4) Retrorenal abscess, limited in front by the kidney, behind by the aponeurosis of the quadratus lumborum. It is at the weak points of this posterior wall that the pus tries to go through to the surface,—that is to say, at Grynfelt's triangle and that of J. L. Petit.

I would recall that Krymov has explained these localizations by the varieties of position of the lymph-nodes, and that he has described in the fatty capsule of the kidney, the abscess, according to his views, being a suppurating adenitis.

As to the macroscopic changes of the tissues involved, Maas describes them as follows: "What is characteristic of perinephritic abscess is that, in the majority of cases, the process of suppuration develops along with a process of induration. This tendency to induration explains certain peculiarities of the perinephritic suppuration: the localization, the frequent partial absorption of the pus, and the difficulty that it finds in breaking into the neighboring organs. In other cases in which the suppuration predominates over the process of induration, an enormous purulent collection is found."

The process of suppuration appears to me to generally predominate over that of induration, and, in the five cases that I have notes of, there was pus in great quantity.

The case reported by Legneu, Lepage, and Convelaire is the most interesting from the pathological standpoint, as it shows that there was an important process of induration which resulted in the formation of a pocket, the size of two fists, with a smooth and regular surface and firm, indurated walls. This pocket kept up a fistula which was not due to a communication between the kidney and abscess cavity, as often happens in suppurating perinephritis following calculous pyonephrosis, because examination after nephrectomy distinctly showed

that, although the kidney adhered strongly to the wall of the abscess, there was no trace of either an old or recent communication between the pus pocket and the renal gland, nor with the renal pelvis or ureter. This pathologic fact should be known on account of its clinical import. Microscopical examination by Convelaire showed that the kidney was normal and presented no evidence of inflammation.

In no case that I am familiar with did the inflammation of the perirenal tissues end in resolution, as has been reported by some, among others, Maas. The rapidity with which the inflammation ended in suppuration varies and permits one of distinguishing two principal clinical types of the process. It is termed acute when the pus has frankly collected toward the tenth or twelfth day. If it is not let out by an operation it migrates either inwardly or towards the neighboring viscera.

The evolution may be slow, and this is what is the more frequent. The fever and pain persist for from three to five weeks before the collection of pus forms. When left to itself the process may end in recovery after a spontaneous evacuation of the pus through the lungs or large intestine. But this is exceptional, and usually, when the pus makes its way to the cutaneous surface, into the bronchæ or colon, the resulting fistula is insufficient to assure proper drainage for a suppurating process of such importance. There may be, in the beginning, some improvement, but the fever holds on and may even be rather high, the general health continues to get worse, and, finally, cachexia and death result.

When, on the contrary, the surgeon acts in time and the pus is evacuated and the cavity properly drained, the recovery is complete within four or five weeks. The fever rapidly subsides, the general health improves, the suppuration lessens as the pocket fills and contracts, while the closing of the lumbar incision quickly occurs. It can, however, happen that, after the interference, fistulæ persist, resulting from an insufficiently free opening and drainage, or due to the presence of a fibrous shell keeping up an abundant suppuration. Under these circumstances another operation is imperative, because, if the fistulæ are allowed to subsist, the patient will progressively fail and may die from some intercurrent affection or the effects of cachexia.

When one considers perinephritic abscess in general, it would appear that it is a serious affection, very dangerous to life. According

to Küster's statistics, out of a total of 230 cases there were 145 recoveries, 79 deaths and 6 cases of persistent fistulæ.

But in the particular case with which this paper is concerned, perirenal abscess following labor, it appears that, although serious, the prognosis is, however, more favorable. All five cases that I have notes of ended in recovery, and it is in the etiologic conditions that the explanation is to be found. The study of statistics teaches us that the elements governing the gravity of the prognosis are: In the first place, the migration of the purulent collection into a visceral cavity, thoracic, intestinal, or peritoneal; next, the persistence of the causative factor which keeps up the suppuration, leading to cachexia and death. This is what takes place in cases of perirenal abscess following a calculous pyonephrosis when there is a fistulous communication between the kidney and the abscess cavity.

The abscesses considered in this paper enter into the retrorenal class, and they have a tendency to open into the lumbar region, as the cases reported in the literature show. Besides the puerperal pyelonephritis, which is often the causal factor of the abscess, postpuerperal genital infection is also the cause, and there are lesions of sufficient persistency to keep up a suppurative process by constantly reinfecting the tissues involved.

There is one other element of prognostic importance, and this is the hands of the obstetrician and surgeon. I refer to the rapidity of the diagnosis and an early surgical interference.

The treatment of perirenal abscess is, above all, surgical. As soon as deep fluctuation can be detected, showing that there is a pus focus, this should be immediately opened and drained for obvious reasons.

The technic is so admirably given by Lejars that it cannot be improved on, and, therefore, I will give it here. The patient should be placed on the healthy side in good light. The twelfth rib, the iliac crest, and spinous line are taken as landmarks. At four fingers' breadth from the spinous line a longitudinal incision is made, slightly oblique, starting at the twelfth rib or a little below, and is carried almost to the iliac crest. Incise the skin and subcutaneous fat, which is often œdematous, and the superficial aponeurosis, and cut directly down without paying too much attention to the successive layers that you go through, always keeping in contact with the external border of the sacrolumbar mass, down to the deep, distended, and almost hard tumor, which, little by little, becomes more distinct. Do not

pay any attention to the vast opening made in order to reach it. If you keep to your initial direction, nothing need be feared. A few small lumbar arteries may be cut, but they will not require ligating.

As soon as the pus escapes enlarge the opening, particularly at its lower portion. Useless and dangerous are all manipulations within the abscess cavity. Simply allow the pus to flow out, and then wipe out the cavity with gauze sponges. Next explore with the finger to ascertain if there be any diverticulum or cul-de-sac requiring opening, but do not peel off any membrane in order to even out the cavity. Place two large drainage tubes leading down to the bottom, and suture them to the incision. Leave the latter open and pack lightly with gauze.

The first few days the oozing will be considerable, so that the dressings must be frequently changed.

The lumbar incision is necessary and urgent, even when the pus has been emptied *per rectum* or by the bronchæ. When the condition of the patient will allow, the operation is to be done under general narcosis, but if he is too weak to support general anæsthesia, the operation is to be done by local anæsthesia with cocaine or other anæsthetic.

CONCLUSIONS

1. Perirenal abscess may occur as a complication of the postpartum. It is not well understood, and for this very reason we desired to call attention to it. It requires surgical treatment, which will give the greater chance of success the earlier it is resorted to. In the interest of the patient, the diagnosis should be made as soon as possible, and is usually easy "if one only thinks."

2. The principal elements of the diagnosis are: Lumbar pain increased by pressure, fever, and tumefaction in the lumbar region.

3. The pathogenesis comprises two principal elements: (*a*) The trauma on the perirenal tissue by muscular efforts of labor; (*b*) infection coming from the kidney or genital tract by way of the lymphatics. It is to be remarked that the primary urogenital infection may be mild, so much so as to pass by unnoticed, and may appear all out of proportion to the secondary inflammation of which it is the causal factor.

4. The prognosis is generally good when an operation is undertaken early in the process.

FRACTURE OF THE CAPITELLUM

BY JOHN H. JOPSON, M.D.

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In the discussion of the operative treatment of fractures in general, especially of those involving the joints, the advisability of operation is one which permits the exercise of discretion on the part of the surgeon when dealing with individual cases.

It may be well to draw attention to one of the rarer varieties of elbow fracture which calls so imperatively for operative intervention that the opinion of those who have encountered it in their practice is practically unanimous that no other method of treatment can be relied on to give a satisfactory functional result. By this we mean fracture of the capitellum.

It is true that fracture of this portion of the lower end of the humerus is of infrequent occurrence, but, having recently had a case in our own practice, we think it worth while to place it on record along with others of a similar nature.

The capitellum is that portion of the external condyle of the humerus which is covered with cartilage and articulates with the head of the radius. The following description of the capitellum or capitulum, or eminentia capitata, as it is sometimes styled, is taken from Piersol's "Human Anatomy":

"The capitellum, on which the concave head of the radius plays, is situated on the front of the outer part of the lower end. It is not far from being a portion of a sphere, since it is convex and nearly equally so in all directions, but the arc from above downward is the longest. A groove runs between it and the outer ridge of the trochlea; the outer border is straight; the posterior runs from it obliquely backward and inward. The capitellum is placed so much to the front as to be nearly or quite invisible from behind; hence the articular surface is much more extensive on the front than on the back. The radial fossa, a small depression above the capitellum, receives the edge of the head of the radius in extreme flexion."

Fig. 1.

Fracture of the capitellum. (Lateral view.)

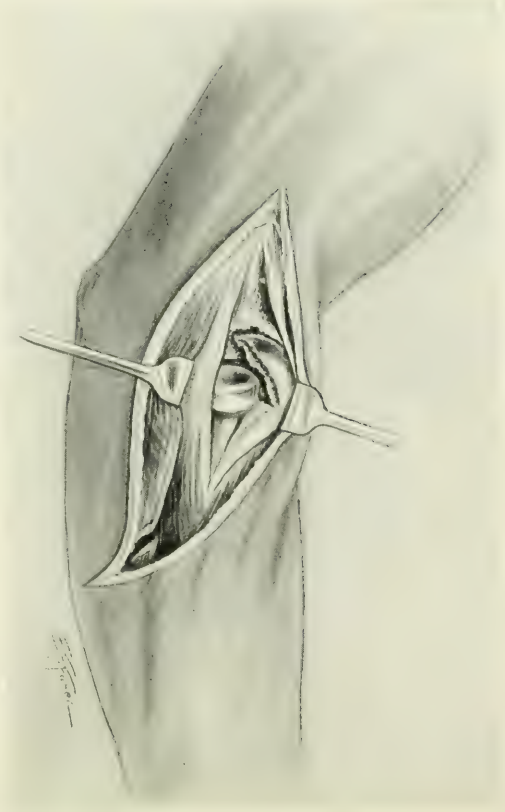
Fig. 2.

Anteroposterior view.

Fig. 3.

Kocher external incision.

Fig. 4.



Exposed joint.

Our case was that of T. V., male, 38 years, who, on September 28, 1913, fell, while running across the street, and struck himself, he thinks, upon the left elbow. The accident was followed by severe pain in the arm and disability of the limb. When examined by us an hour later he was suffering great pain and there was slight swelling in the region of the joint, with crepitation over the radiohumeral articulation on supination and pronation of the forearm. Pain was severe during this manipulation, and also on flexion and extension. There was slight increase in lateral mobility of the joint, but no displacement of condyles or olecranon could be detected.

The arm was dressed on an anterior angular splint, in spite of which the patient suffered great pain all night; when dressed next day, moderate swelling was present. The following day an X-ray was made at the University Hospital by Dr. Graves, and a fracture of the capitellum was found. In a lateral view the capitellum was seen to be separated from the humerus at its base, the line of fracture being quite horizontal, and the fragment was rotated forward and upward as if hinged at its anterior margin, so that the articular surface looked upward and forward, the fractured surface downward and backward (Fig. 1).

In the anteroposterior view the fracture was less conspicuous; but the picture showed absence of involvement of the trochlea (Fig. 2). An internal splint was substituted for the anterior angular splint. No attempt was made at reduction, but the patient was advised that an operation would be necessary. The change of position in the forearm was followed by material relief from the severe pain. He was operated on October 3, 1913, Dr. Ashhurst assisting. The joint was opened through Kocher's external incision, which gave a most excellent exposure (Figs. 3 and 4). A couple of very small fragments were removed from the surface of the condyle, and the main fragment, still adherent by its anterior edge to the anterior surface of the condyle, was easily turned back into place. No attempt was made to attach it by sutures, as it was held firmly in place when the forearm was put in Jones's position. The capsule was sutured and the wound closed without drainage, the arm being dressed in acute flexion suspended from the neck.

The patient suffered considerable pain, especially at night, for some days after the operation, but this gradually subsided. Primary

union was obtained, except at one point, where a small stitch abscess formed, but it healed quickly after being opened. The Jones's position was maintained for twenty-six days, when the arm was dropped to a right angle, and, after a couple of weeks in this position, the patient was encouraged to use it. There was a rapid return of motion, especially flexion, and by the middle of November it was noted the patient was able to extend the arm to about 130 degrees. Supination and pronation were perfect, and he could play the piano. When seen on December 22, 1913, the functional recovery was complete, except that extension was still stopped at about 165 degrees, or 15 degrees less than the straight line. No pain and no inconvenience were present at this time. Some contraction of the capsule in the line of incision apparently holds the arm from complete extension, but this will doubtless be overcome in time.

It is notable that the patient, nine years before, had been under our care for an unusual injury to the right elbow, namely, a fracture of the coronoid process of the ulna with a detachment of a thin articular fragment of the condyles. Recovery from this had been complete, convalescence being delayed by marked interference with supination and pronation, and the tendency to formation of adhesions between the head of the radius and the external condyle which required to be frequently broken up by passive motions and massage.

Dr. Carleton P. Flint,[1] in 1908, reported a case of fracture of the capitellum and collected from the literature references to sixteen others, in fifteen of which the reports were accessible; these he carefully studied and analyzed, finding, as Hans Lorenz and Kocher had already pointed out, that there were two distinct classes of cases represented in this collection. The larger and more important group, ten in number, included cases reported by Hahn, Steinthal, Wright, Cotton, Stimson (three cases), Stebbins, Flint, and Wilms. No data in the last-mentioned case were available. The second group included four cases reported by Kocher and two by Lorenz. In the first class there is a separation of the capitellum, in whole or in part, by a splitting fracture passing through the bone, while in the second the injury partakes of the nature of a partial or complete avulsion of the cartilage covering the capitellum, to which piece of cartilage, however, portions of the spongy tissue may adhere. It is to the first group, which has been called the *fractura capituli humeri totalis,* that

our class belongs, and not to the second, or the *fractura capituli humeri partialis*—poor names, both of them, as Flint insists.

The second group may be briefly dismissed. Of very infrequent occurrence, they are, in the majority of cases, due to indirect violence, possibly by traction through the anterior capsular attachments pressing backward on the cartilage and prying it off, as when the injury occurs while lifting with the forearm extended (Kocher)—an explanation not accepted by Lorenz or Flint.

Chronic arthritis of a proliferating type seems to predispose to the accident. The symptoms are a snap in the joint and sharp pain at the time of occurrence, very little local reaction, and a limitation of extension due to the backward displacement of the detached cartilage, which can be palpated behind the external condyle, between it and the olecranon and head of the radius. There is temporary restoration of extension when this fragment is pushed forward into position. Flexion and pronation are not much interfered with, but supination may be limited, and valgus deformity is sometimes present; soft crepitus may be obtained. The X-ray shows irregularity of contour and weakening of the normal shadow of the capitellum (H. Lorenz).[2] The treatment is operative, and consists in removing the fragment through an appropriate incision, which was done in all the cases reported, with uniformly good results.

Of what might be termed true fractures, in which there is a detachment of the whole or a good-sized portion of this prominence, the number of cases which have been reported seems surprisingly small. It is probable that many were overlooked in the past or were classed with fractures of the head of the radius, which they somewhat resemble. Flint quotes Kocher as expressing the opinion that the type he describes—that of cartilage avulsion—is not uncommon, as he observed four cases in three years. But, as there were no more reported for sixteen years until Lorenz added his two, Flint is inclined to disagree with Kocher. We have tried to add, by a search through the literature, other cases to those collected by Flint, excluding those fractures of the capitellum which were complicated by lesions of other portions of the lower end of the humerus, but not those associated with injuries of the radius and ulna.

We found reports of cases by L. A. Dunn,[3] Jonathan Hutchinson, Jr.,[4] Cates,[5] H. Reineking,[6] MacLean[7] (six cases), and Dr.

Henry K. Pancoast, of the University of Pennsylvania, contributed three cases from his private records. These, with our own, make fourteen cases of capitellum fracture. MacLean's cases were gathered in an analysis of 176 cases of fracture of the lower end of the humerus in Perthe's Clinic in Leipzig, and, as they did not seem to be supported by radiograms or clinical notes, and details are lacking, they are of little value except as indicating to an uncertain extent the relative frequency of the injury. Details are also lacking in Pancoast's cases, but the records here are of much value as showing the frequency of occurrence of this fracture in comparison with fractures of the external condyle in general.

Dr. Pancoast kindly furnishes the following data. Out of seventy-nine cases of fracture of the external condyle of the humerus, complicated and uncomplicated, on his records, there were four cases, including our own, in which the articular portion of the external condyle was fractured and displaced. One of these four cases (some of them old injuries) was complicated by a fracture of the head of the radius. The remaining cases we have collected are here abstracted:

L. A. Dunn [3] showed, at a meeting of the Clinical Society of London, a boy of seven with a piece of loose bone in his elbow-joint. He had fallen and injured the elbow three years before. The fragment appeared to be the capitellum, loosely attached to the head of the radius.

Jonathan Hutchinson, Jr.,[4] in a paper on the "Treatment of Injuries of the Lower End of the Humerus," mentioned a case in which he assisted Mr. Treves at an operation for fracture of the capitellum some months after the injury, "in which the capitellum was found to be completely turned around, so that its normal lower surface faced upwards, and in which considerable improvement followed its removal." He mentions this as an example of the tendency of such fractures to result in the presence of a loose body in the joint producing an impairment of function, and also gives several other cases of fracture of the capitellum, all probably complicated ones, in which the fragment had become adherent to the head of the radius with or without the development of a pseudarthrosis between the end of the humerus and the separated fragment.

Cates [5] reports the case of a man who fell from a bridge, sustain-

ing a fracture of several bones, including the ischium, the bones of the wrist, the head of the radius, and the coronoid process of the ulna. The capitellum was apparently fractured. The injuries resulted fatally.

H. Reineking[6] described this injury in a boy of nine who fell from a wagon, striking his left elbow. The early symptoms were pain excited by passive motion, limitation of movements of the joint to 45 degrees of flexion and 140 degrees of extension. There was no disturbance of pronation or supination, either active or passive. A slight swelling was present, more marked on the radial side of the joint, and tenderness over the external condyle near the articular surface. There was no palpable displacement of, or alteration in, the relation of the bony landmarks, and no crepitus. Later, ecchymosis appeared, and thickening under the upper portion of the supinator longus was noticed, with a persistence of limitation of motion as described above. The case was treated as a fracture of the external condyle. An X-ray, twenty-four days later, showed a complete separation of the capitellum, with displacement upon the anterior surface of the condyle, the fractured surface facing the humerus and tilted at an angle of 90 degrees. Attempts at reduction under anæsthesia, made a few days later, failed, and, operation being refused, splinting was continued. Six months later it was noted that all pain and tenderness were gone, motion, passive and active, was possible between 45 degrees and 165 degrees, or 120 degrees; the prominence in front of the external condyle and some "gunstock" deformity remained.

We are fortunate in being able to show some statistics which throw light on the relative frequency of capitellar fractures and those of the condyles in general. The statistics furnished us by H. K. Pancoast, of the X-ray Laboratory of the University Hospital, have been already quoted. Of seventy-nine cases of fracture of the external condyle of the humerus, complicated and uncomplicated, there were four, including our own, in which the articular portion of the external condyle was fractured and displaced.

J. E. Platt,[8] in an analysis of sixty fractures of the lower end of the humerus, had no pure case of capitellum fracture. In one case there were probably fractures of both capitellum and trochlea, complicated by backward dislocation of the head of the radius, and

inward dislocation of the upper end of the ulna. No operation was done.

A. P. C. Ashhurst [9] had twelve fractures of the external condyle in fifty-six fractures and epiphyseal separations of the lower end of the humerus, none of them of the capitellum.

MacLean,[7] in a study of the operative treatment of elbow fractures in Perthe's Clinic in Leipzig, analyzed 216 cases, of which 176 were of the lower end of the humerus; six of these were diagnosed as fractures of the capitellum, but no X-ray pictures or details are furnished, and the cases are of doubtful authenticity.

Counting these figures, and accepting MacLean's cases at their face value, it will be noted that in 371 fractures of the lower end of the humerus there are not more than ten of the capitellum alone, or 2.69 per cent., and, when we recall that Pancoast's list comprises only fractures of the external condyle, and that these would probably not include more than one-third of all his cases of fracture of the lower end of the humerus, it would seem that isolated fracture of the capitellum would not occur in over 2 per cent. of injuries of the condyles, and probably not even to this extent. Cotton has seen but one case, and Stimson, with his unrivalled experience, reports but three.

The fact that exact diagnosis of the fracture is difficult without the X-ray picture explains the unfamiliarity of the older writers with the injury. Thus, Hamilton,[10] as late as 1884, quotes Stimson as giving but three examples of intracapsular fracture of the lower end of the humerus. Hamilton says the same difficulties present themselves here as in supposed examples of intracapsular fracture of the head of the humerus. He seems to think that when union has taken place it is conclusive evidence that the fracture was not entirely intracapsular, and states that in these three cases mentioned by Stimson there is no testimony to show that the line of fracture was entirely within the capsule, and says that, until we find a recent accident in which autopsy shall show such condition, the testimony is not conclusive. At present this kind of testimony, he says, is wanting.

Jonathan Hutchinson, Jr.,[4] in a discussion of injuries of the lower end of the humerus, also laid down the law that bony union was not to be looked for in cases of intra-articular fracture of the

capitellum, and goes on to describe the case included in our series under his name as a confirmatory example of this law of non-union in intra-articular fractures. We know now that intra-articular fractures will unite when reduction is complete and fixation is absolute and prolonged, as repeatedly demonstrated even in the hip-joint.

John H. Poland,[11] in his work on "Traumatic Separation of the Epiphyses," quoted Sir Astley Cooper to the effect that if the epicondylo-capitellar fracture be entirely within the capsule it does not unite by bone, whereas, if the fracture be very oblique, and a considerable portion external to the capsular ligament, steady and long-continued support will cause it to unite.

Poland also states there was only one clinical case reported of epiphyseal separation of the capitellum, but this a doubtful one, and the age given as seven years. If it did occur, he says the separation would be entirely within the capsule. As a reason for the infrequency of isolated fracture of the capitellum he advances the view that it is due to anatomical relations, the external epicondyle being so largely connected with the capitellar epiphysis. He refers to the cases of Hahn, Gurlt, Wright, Hutchinson, and Dunn. Flint studied the reports of nine cases. Of the fourteen cases which we have added, in only five are any details obtainable, and in three (Dunn, Hutchinson, Cates) the clinical history is of the scantiest, while in two—Reineking's and our own—the more complete history is available, and has already been detailed. For most of the following data, therefore, we are indebted to Flint's careful study of the subject, and, before him, to Hahn.

The accident is more common in males than females, and the ages range from seven to sixty-three, four being under the age at which the epiphysis of the capitellum becomes united. The common cause is direct violence to the elbow, especially when flexed. In none of the cases was there a predisposing pathological condition present in the joint. The usual symptoms are pain, swelling, ecchymosis, disability, and limitation of motion, and sometimes crepitus, the latter symptom not always to be elicited. The disability and local symptoms of fractures are less pronounced when, as occasionally happens, the displacement of the fragment is inconsiderable or in a backward direction, and correspondingly more pronounced and typical when, as usually happens, the broken portion turns forward and upward

in front of the head of the radius to an angle of 90 degrees, where it forms a prominence in front of, and to the other side of, the external condyle beneath the supinator longus muscle. Flexion is much inhibited, as by "a stone in a hinge," and extension also interfered with, but usually to a lesser degree.

Supination and pronation may be painful at first, but are not usually permanently affected, even if the condition goes unrecognized and uncorrected. Slight valgus deformity has been noted. If unreduced, a permanent thickening may increase the prominence of the displaced fragment and aid in fixation of the same, or the fragment may remain unattached and movable with persistent joint crepitus and pain, and pronation and supination may suffer. In one or more instances, when complicated by fracture of the humerus and other injuries, the capitellum has become adherent to the end of the radius and a pseudarthrosis has formed between it and the end of the humerus (Hutchinson, Walther); and in Dunn's case, included in our list, a similar attachment to the head of the radius was supposed to be present.

The diagnosis of this injury is not always easy in the absence of a radiograph, and mistakes have been made and the condition overlooked. There are usually considerable pain, tenderness, and local reaction, as well as marked disability, and this is most pronounced in the movements of flexion and extension. Also, the preservation of the normal outlines of the condyles and olecranon posteriorly, and the presence of a hard body, perhaps movable, on the outer side of the flexor surface of the elbow (rarely behind the condyle), although this is not always palpable, serve to distinguish fracture of the capitellum from fractures of the external condyle and of the head and neck of the radius, or at least lead to a suspicion that a rarer injury is present.

Treatment.—This is operative. Those cases not operated on have yielded poor results, in that function has been permanently interfered with, and this mainly in the important movements of flexion and extension, while pronation and supination may be interfered with or may be normal. A valgus deformity will possibly be present, and pain, exaggerated by using the arm, may be expected for a long time. The attempt has been made to dress the arm in such a position that the fragment will fall back and be held in its normal position.

Stebbins treated his patient with the arm in complete extension, in which position the fragment seemed to be reduced, but the final result could not be considered as functionally ideal.

In the cases studied by Flint, operation was performed in six of the nine cases of fracture of the type in which we are concerned, namely, the partial or complete fracture as distinguished from the cartilage avulsion type. In two cases partial or incomplete resection of the joint was done, for indications more or less peremptory (compound injury—secondary inflammation). Of the remaining four, in three the fragment was removed, while in one of Stimson's cases it was found that the lower two-thirds of the capitellum had a posterior attachment (it was one of the unusual variety, where, as in cartilage avulsion, the fragment had been turned backward), and instead of removing it, Stimson turned it forward and sutured it in place by stitching the periosteum and secured a good result. Treves removed the fragment in the case reported by Hutchinson. So far as we know, none of the cases we have added to Flint's series were operated upon except Treves's and our own.

The fear of the fragment losing its vitality if not removed seems to have influenced surgeons to excise it. Our case is the only one besides Stimson's in which reduction appears to have been made, and in ours no retention sutures were used, flexion alone being depended upon to hold the fragment in its normal position. In Wright's case there did appear to be secondary infective changes in the joint at the time of operation, one month after the fracture occurred, and these may have been superimposed upon a devitalization of the detached fragment. The changes were such as to lead Wright to excise the joint. This is the only case in which suppuration occurred before operation. With our present attitude in surgery of the articulations it would seem wise to conserve the fragment with or without suture or nailing of the same as seems indicated, unless comminution or other complications be present.

Kocher's incision for excision of the elbow-joint is the one we employed, and is too well known to need description. Where the surgeon's object is, as in the procedure under discussion, merely to open the joint in order that he may replace or remove the fragment of the fractured eminentia capitata, the lower portion of the incision which curves backward over and divides transversely the

lower fibres of the anconeus will probably be unnecessary. The exposure of the joint for any work on the external condyle or head of the radius is ideal, although Kocher himself states that here Cavazzini's transverse incision is occasionally of value (in diseased conditions).

For the Kocher-Lorenz type of injury, direct limited incision over the movable body has been practised through the centre of Kocher's incision, which is preferable when possible, or by division of the anconeus fibres when the fragment takes a position behind the external condyle, as it frequently does in this variety (Lorenz). Here also the results of removal have been excellent.

REFERENCES

[1] Carleton P. Flint, *Surg., Gynæc. and Obstet.*, Sept., 1908.
[2] Hans Lorenz, *Deutsch. Zeit. f. Chirurgie*, 1905, vol. 78, p. 531.
[3] L. A. Dunn, *Lancet*, Dec. 3, 1892, p. 1273.
[4] Jonathan Hutchinson, Jr., *Brit. Med. Jour.*, Nov. 3, 1894, p. 967.
[5] Cates, *Med. News.*, lxviii, 1896, p. 716.
[6] H. Reineking, *Surg., Gynæc. and Obstet.*, Dec., 1909.
[7] MacLean, V. Brun's *Beit. z. klin. Chirurgie*, lxxv, 3, 1912.
[8] J. E. Platt, "Contribution to the Surgery of Fractures and Dislocations of the Upper Extremity," London, 1899.
[9] A. P. C. Ashhurst, "An Anatomical and Surgical Study of Fractures of the Lower End of the Humerus," 1910.
[10] Hamilton, "Treatise on Fractures and Dislocations," 7th ed., 1884.
[11] John H. Poland, "Traumatic Separation of the Epiphyses."

CONGENITAL HYDRO-URETER AND HYDRONEPHROSIS

BY LEO BUERGER, M.D.

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THERE is, perhaps, no more important and interesting class of lesions of the urinary tract than the anomalies of the kidney and ureter. Nowhere else in the body are congenital malformations more frequently encountered, and nowhere do they play such an important rôle; for they cause a predisposition to infection, and have a destructive influence upon the functional capacity of the urinary organs. Before instituting radical operative measures for the relief of renal lesions the occurrence of such a condition must be carefully considered.

For the genito-urinary specialist, the urologist, the surgeon, and the pædiatrist a knowledge of the types of urinary anomaly occurring in infants and children is a prerequisite for the correct interpretation of many cases. Thus, in every instance of so-called pyelitis or cystitis in infants and children in which the symptoms persist beyond the usual time, the presence of renal anomalies must be regarded as possible or should be excluded; for, not infrequently, the advent of symptoms in such patients indicates merely the beginning of a more serious and destructive lesion which finally terminates in death, autopsy revealing some anomaly, such as congenital dilatation of the ureters, congenital hydronephrosis, with secondary infection and destruction of the parenchyma of the kidney.

It may not be amiss, therefore, to record here the history of a very interesting case of bilateral congenital dilatation of the ureters, and to point out how the diagnosis can be made.

In our patient there were associated two sets of clinical symptoms: First, an *apparent* obstacle to the outflow of urine in the urethra, as evidenced by an inability to void; and, second, most profound changes in the kidneys and ureters, doubtless congenital in origin. The value of the X-ray after filling of the bladder with a silver salt,

together with cystoscopy, was well demonstrated here, for by these means exact anatomical diagnosis of the lesion at hand was made possible. It is more than likely that most of these cases have heretofore remained undiagnosticated, until, by virtue of progressive dilatation of the kidneys and ureters, a large kidney was felt, or the enormously dilated ureters could be palpated as distinct sausage-like cords.

The following is the history:

N. B., male, 6 years of age, was admitted to the Pædiatric Service of the Mount Sinai Hospital, July 21, 1911, with the diagnosis of *pyelitis*, which had been present for nine weeks. About a month previously there were intestinal symptoms, some pain and tenderness in the right lumbar region, and bloody stools. The urine, July 21, 1911, was acid, specific gravity 1008, albumin plus, sugar negative, and the microscopic examination showed very many pus cells.

Patient was readmitted August 12, 1912, to the service in charge of Dr. Henry Heiman.[1] The parents said that the urine had been cloudy for a long time. There were no urinary symptoms, no hæmaturia, no pain. The child was brought to the hospital not because of any trouble with the urinary organs, but because of the recurrence of the intestinal disturbances, the presence of mucus and blood in the stools, and diarrhœa.

Urinary examination again revealed the presence of a large amount of pus in the urine, the bacteriological examination showing *Bacillus pyocyaneus* in pure culture.

Although micturition appeared to be normal, it was discovered that quite a large amount of residual urine was regularly present.

Catheterization during September, 1912, showed that there were some four or five ounces of residual urine in the bladder.

In spite of frequent irrigation, the cloudiness of the urine continued, so that the patient was referred by Dr. Heiman to the genito-urinary department for cystoscopy on October 1, 1912.

October 1, 1912.—*Cystoscopic examination* showed a moderate degree of diffuse cystitis. Most remarkable, however, was the patulous condition of both ureteral orifices. The left orifice was enormously dilated, resembling the mouth of a small diverticulum. The right ureter was also very much enlarged, although it still retained some of the natural outline of a normal ureteral orifice.

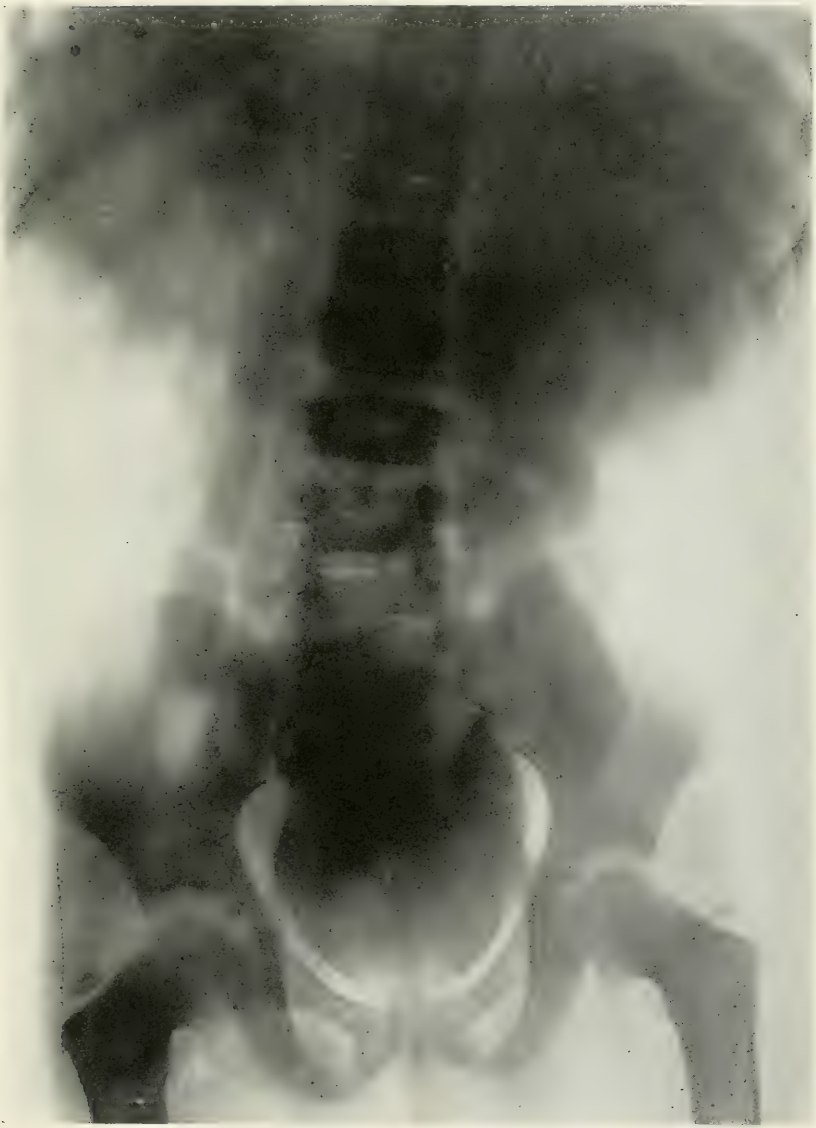
From the presence of these dilated ureteric orifices, the *presumptive diagnosis of hydro-ureter*, with probable dilatation of the pelvis of both kidneys, was made by the writer.

It was advised, in view of these findings, that the condition of the ureters and kidneys be investigated by the injection of argyrol into the bladder. After such injection, in cases of relaxed ureter, the argyrol readily finds its way into the ureters and kidneys, where its presence can be utilized for purposes of pyelography.

Therefore, on October 7, 1912, after the instillation of 10 per cent. argyrol into the bladder, the patient was put in the Trendelenberg posture and an X-ray

[1] I am indebted to Dr. Henry Heiman for the clinical notes taken while the child was on the Pædiatric Service (attending pædiatrist, Dr. H. Koplik).

Fig. 1.



Pyelogram showing dilatation of ureters.

Fig. 2.

Pyelogram showing more definitely the outlines of the left ureter and renal pelvis.

taken. Unfortunately, but little of the argyrol had found its way into the ureters, and, therefore, only an outline of the bladder, together with the dilated lower ends of both ureters, could be recognized in the pictures. On October 18 75 Cc. of a 20 per cent. solution of argyrol, freshly prepared, was put into the bladder and the fluid allowed to run back into the kidneys, and most excellent plates were obtained. Immediately after X-ray examination the bladder was thoroughly irrigated, the presence of this strong solution being followed by no untoward symptoms. On the contrary, the urine, which had been very cloudy and purulent, rapidly improved, becoming much clearer and almost free of pus.

A reference to Fig. 1 will show the shadow of the bladder, the right ureter somewhat less distinct in outline than the left, the left ureter almost as thick as a thumb, extremely tortuous and leading to a considerably dilated pelvis. The enormous dilatation of both ureters is so evident as to require little comment.

With a view of obtaining a still more definite outline of the ureters and renal pelves, it was decided to repeat the argyrol injection a week later. This was done with a 40 per cent. solution, and the picture seen in Fig. 2 was obtained. Here, for some reason or other, the argyrol failed to show in the right ureter, but the outline of the left ureter, its tortuous course, and the peculiar shape of the left renal pelvis came plainly into view.

On the day on which the cystoscopy was done, as well as at each succeeding argyrol injection, the bladder was found considerably distended, at one time holding about 300 Cc. of fluid. However, no obstruction was met, either by the cystoscope (which was of calibre of 12 Fr.), nor by silk catheters, 14–16 Fr., inserted for the purposes of argyrol injection. It seems obvious, therefore, that, although there was no urethral obstruction to the passage of a rigid or flexible instrument, the child was, nevertheless, suffering from chronic urinary retention.

June 28, 1914.—I had seen the patient in consultation and had found that the bladder was enormously distended, the patient unable to void spontaneously. Catheterization was advised, and on certain days a permanent catheter was left in, thick, purulent urine being drained off.

On July 23, 1914, the patient was again admitted to the children's service of Mount Sinai Hospital. The general condition was seen to be very poor, the skin dry, the usual signs of a defective kidney function being present. Asthenia, loss of appetite, and headache were rather marked symptoms.

On July 26, 1914, an intercurrent diphtheria took off the patient.

Only a partial autopsy was permitted, and the kidneys, ureters, and bladder were removed *in toto*. The following is a description of the specimen.

This consists of the kidneys, ureters, and bladder (Fig. 3).

Both kidneys are hydronephrotic, the right very much enlarged for the age of the patient (8 years), being almost three-fourths the size of an adult's kidney. The pelvis is very markedly dilated. The parenchyma is markedly attenuated in places, so as to be practically membranous, where the calyces approach close to the capsule. At the lower pole, however, there is a fair amount of renal tissue. The extra-renal portion of the pelvis is markedly dilated, emptying in a funnel-shaped manner into an enormously enlarged ureter.

The *left kidney* is very much enlarged, being larger than an adult's kidney, and shows the same hydronephrotic changes as the right. In addition, however, there is a cortical abscess in the upper pole, the pelvis being filled with pus.

The *ureters* are enlarged to about the size of an adult's small intestine,

tortuous, measuring 9 to 11 Cm. in circumference, and emptying into the bladder by very much dilated orifices. The right ureteral orifice is circular in outline and shows none of the normal markings. The left orifice is also patulous, but more oval in outline.

The *bladder* is very much dilated, and was distended with purulent urine at the time of the autopsy. Its wall is thinned out; there are no trabeculæ, the interior being smooth. The trigone is considerably enlarged; the distance between the ureters, 4.5 Cm.; between the ureteral orifices and the sphincter, 4 Cm. The trigonal mucous membrane is somewhat rough, as is also that over the vertex of the bladder (localized cystitis). In general the appearance is that of an enormously enlarged adult bladder rather than that of a child's. The sphincteric region is negative; the verumontanum is apparently slightly enlarged, being prominent probably by reason of the marked depressed condition of the lateral sulci. There is nothing abnormal in the urethra.

Analyzing the salient clinical and diagnostic features of this case, we have a boy who comes to us with the history of recurring intestinal disturbances and of "pyelitis" with pyuria lasting some months. Cystoscopy reveals enormous ureteral orifices, which are at once interpreted as indicative of ureteral ectasia. Argyrol injected into the bladder is permitted to run "up" the ureters, and subsequent X-ray pictures show distinct signs of enormous ureteral dilatation. Associated with these manifestations, there are evidences of a paretic condition of the bladder, residual urine being constantly present. Within a period of about two years renal insufficiency develops, an intercurrent infection rapidly leading to a lethal outcome. Autopsy confirms the clinical diagnosis of bilateral hydro- and pyonephrosis, hydro-ureter, and marked vesical enlargement, all these probably of congenital origin.

The question as to the causation of the urinary retention in the bladder, on the one hand, and of the bilateral hydro-ureter and hydronephrosis, on the other hand, affords the most interesting food for reflection in this case.

It is evident that throughout the period of observation, somewhat more than two years, there was distinct inability to empty the bladder completely, as evidenced, first, by residual urine of some 4 to 6 ounces, and finally terminating in complete urinary retention. At no time, however, could any sign of an obstacle in the urethra be detected, both catheters (14–16 Fr.) and cystoscope (12 Fr.) having been passed with ease.

At autopsy, too, there were no lesions, either of the neck of the

Fig. 3.

Specimen of hydronephrotic kidneys and enlarged ureters.

bladder or of the prostate, verumontanum, utricle, or urethra, that could in any way be regarded as offering an obstacle to the outflow of urine.

There are cases of urinary retention in infants and children in which some obstructive lesion is present, particularly in the posterior urethra; sometimes a peculiar hypertrophy of the verumontanum, at other times a cyst of the utricle or tumor of this region. As a result of the urinary back pressure, hydronephrosis and hydro-ureter may develop. Other cases of urinary retention are secondary to some nerve lesion, as a degenerative or acute inflammatory process in the spinal cord. In addition to these, however, there is a group of cases in which retention of urine occurs, is associated with dilatation of the bladder, with considerable enlargement of the ureters and renal pelvis *without any demonstrable organic obstruction.*

It is doubtless to this latter group that our case belongs.

The existence of a paretic condition of the bladder and urinary retention without organic obstruction is known, although the variety presented by our case is not so well recognized. Thus, Thompson Walker, in his "Genito-Urinary Surgery," speaks of an idiopathic type of atony of the bladder in which there are no signs of nervous disease or organic obstruction. In four of his cases chronic distention of the bladder was present and the power of voluntary micturition was greatly impaired. In the remaining cases there was residual urine of from 4 to 10 ounces in amount. There was loss of sensation in the bladder, with reduced frequency of micturition in all but three cases, in which there was increased frequency without cystitis. Well-marked trabeculation of the bladder was found in all. Ureteral obstruction and spinal disease were eliminated. The lesion in these cases was probably in the lowest reflex centres of the bladder, namely, hypogastric and hemorrhoidal plexus of the sympathetic. In nine cases there had been atony of the bladder for from two to eighteen years without development of symptoms of spinal disease. He says that it is possible that a lesion localized in the spinal reflex centre of the bladder might be the cause of this atony, but why such a lesion should remain confined to the bladder centre in all these cases is difficult to explain.

Careful physical examination of our own case failed to demonstrate any nerve lesion, nor did the X-ray reveal a spina bifida occulta.

The history, too, recorded no symptoms of an attack of anterior poliomyelitis. The nature of the vesical retention, therefore, cannot be explained.

Although the exact mechanism of the production of the hydro-ureters in this case cannot, in the present state of our knowledge, be regarded as definitely established, the findings and the mode in which diagnosis was made, it seems to us, are of sufficient interest to warrant the hope that a procedure such as adopted here may be of value in clearing up the diagnosis in other cases. The case clearly demonstrates that even in children as young as this one the cystoscope is invaluable; further, that when the ureteral orifices are suggestive of ureteral dilatation, when they are patulous and unusually large, the method of pyelography employed here should be applied. Just as in adults, where there is relaxation of ureteral orifices, so also in infants and children will the injection of silver salts into the bladder, followed by the X-ray, give us valuable information concerning the condition of the superior urinary tract.

From a clinical standpoint—particularly as regards diagnosis—the case presented is instructive not only because of its prognostic importance, but also because it well illustrates that by means of observation cystoscopy, together with injection into the bladder of argyrol solution, followed by the X-ray, a precise diagnosis of an otherwise very obscure condition can be made.

Regarding the pathogenesis of the enormously dilated ureters and the bilateral hydronephrosis, two circumstances speak for the assumption that these were the results of an exaggeration of a congenital anomaly: Firstly, the large size of the ureteral orifices; and, secondly, the great dimensions attained by the expanded ureters, in spite of the absence of any ureteral obstruction. In view of the fact that no organic obstruction was present in the urethra, and that complete retention had been present for but a relatively short period of time, it is hardly conceivable that back pressure alone could explain the unusual size of the ureters and their tortuous and sinuous course. It is true that residual urine was probably present for some time, but even in marked degrees of prostatic hypertrophy (prostatic adenoma) we practically never encounter a condition of hydro-ureter comparable in size with that presented by this case.

Legeu and Papin,[2] too, in a recent contribution read before the French Urological Association, seem to be of the opinion that the condition of the ureters in such cases must be regarded as the result of the presence of a congenital anomaly, stating that the essential lesion is a marked dilatation of the whole ureter, together with its vesical orifice.

Halle, in the discussion, reported two cases in children, 5 and 6 years of age, where the ureters were sinuous and as thick as a thumb. He expressed the opinion that a congenital absence of the musculature of the ureteral orifice in the bladder may prepare the way for symmetrical enlargement of the ureters.

It seems most probable that, given a congenital maldevelopment of the musculature of the pelvis of the kidneys, ureters, and ureteral orifices, coupled with a similar condition of the bladder wall or an acquired vesical paresis, that the efforts of micturition must needs become weaker and weaker as time goes on; for with insufficient ureteral meatuses the urine ascends with ease into the ureters, where it becomes pocketed in puddles, as it were, in the dilated, convoluted, and tortuous channel. And thus a vicious circle is established until the dilatation of ureters and bladder has attained such dimension that micturition becomes impossible. Secondary infection and destruction of the renal parenchyma follow, functional insufficiency being the outcome.

[2] Assoc. française d'Urol., XVII Session, p. 715.

THE ROUTINE ADMINISTRATION OF ETHER IN MEASURED DOSAGE*

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A CAN of ether containing eight ounces by weight, having a specific gravity of .716, measures 11.17 ounces by volume. Ether boils at 96° F., and becomes a vapor which is 2.586 times heavier than air. At lower temperatures it evaporates more slowly, the rate of vaporization at atmospheric pressure varying directly: (1) As the temperature of the liquid ether; (2) as the extent of the evaporating surface; (3) as the rate of renewal of the atmosphere, and, inversely, (4) according to the amount of ether vapor already in the atmosphere.

The vapor has the same temperature as the liquid ether from which it is given off. As ether absorbs heat when changing from the liquid condition into a vapor, the liquid ether and the vapor given off constantly become colder and the rate of evaporation is constantly diminished unless heat is supplied to replace that lost.

To produce and maintain surgical anæsthesia it is necessary to provide an atmosphere containing from 15 to 30 per cent. by weight of ether vapor. The ether vapor displaces a corresponding amount of the atmospheric air. In producing ether anæsthesia it is essential that the supply of atmospheric air be interfered with as little as possible, and that no mechanical interference with the respiration be introduced.

To provide an atmosphere containing a constant but readily varied percentage of ether vapor at operating-room temperature, in sufficient quantity for the need of the patient, is a problem where solution has been attended with varying success. A good method for administering ether by inhalation should be:

1. Simple. It must not distract the attention of the administrator from observing the condition of the patient. The apparatus must not be cumbersome nor likely to get out of order.

2. Clean. Any apparatus which is used more than once must be readily sterilized. It is manifestly unfair to the patient to continue to use an inhaler contaminated by a case of tuberculosis, syphilis, or any infectious disease.

* Read before the New York Society of Anæsthetists, May 8, 1914.

3. It must provide a continuous supply of ether vapor, perfectly and easily controlled. The dose of ether must be measured as used. It is of little value to estimate the amount of ether used at the close of the administration. The ether must not be wasted, as this defeats the advantage of measured dosage.

4. The induction of anæsthesia must be accomplished with minimum discomfort to the patient.

The following are typical examples chosen from the many different ways in which ether is administered:

In 1846, at the Massachusetts General Hospital, William T. G. Morton gave the first demonstration of ether anæsthesia. His inhaler was a glass globe, five inches in diameter, having two openings. One of them was fashioned into a mouth-piece, and the other served for an airway and for adding the supply of ether. The globe contained a sea sponge which was moistened with ether and provided an extensive evaporating surface. Special attention was given to cleansing this inhaler. It was only necessary to substitute a face-piece for Morton's mouth-piece to convert his inhaler into a cumbersome but surprisingly efficient apparatus (Fig. 1).

In 1877 Clover introduced the closed method. His portable regulating ether inhaler consists of a face-piece, an ether reservoir, and a rubber bag. By revolving the ether chamber the amount of ether vapor can be readily controlled. The patient breathes back and forth into the bag, which cannot be readily sterilized. There is no provision for the admission of fresh air, and the frequent removal of the face-piece to admit air results in an irregular anæsthesia. It would be possible to equip this inhaler with a valve for the regular admission of air and to arrange for sterilizing the apparatus, but even then it would be cumbersome.

In the Roth-Dräger instrument a measured stream of oxygen, passing through an aspirator, produces suction which draws a measured supply of ether into the stream. The flow of oxygen is adjustable from 0 to 3 litres per minute. The ether supply can be varied from 0 to 200 drops per minute. The necessary dilution of the ether-oxygen mixture with air brings an element of uncertainty into the carefully-measured dosage of ether. An instrument of this sort could be arranged to deliver, instead of three litres of oxygen, eight to ten litres of air with a constantly regulated dose of ether. The only

objection to such a method for routine use is the expense and bulk of the apparatus.

The beautiful instrument devised by Connell delivers a regulated, constant mixture of air with from 0 to 26 per cent. by weight of ether vapor. The amount of ether used is from three to six grammes per minute, exclusive of the amount used during the preliminary stage. The only objection to the general use of this instrument is the expense and lack of portability of the apparatus.

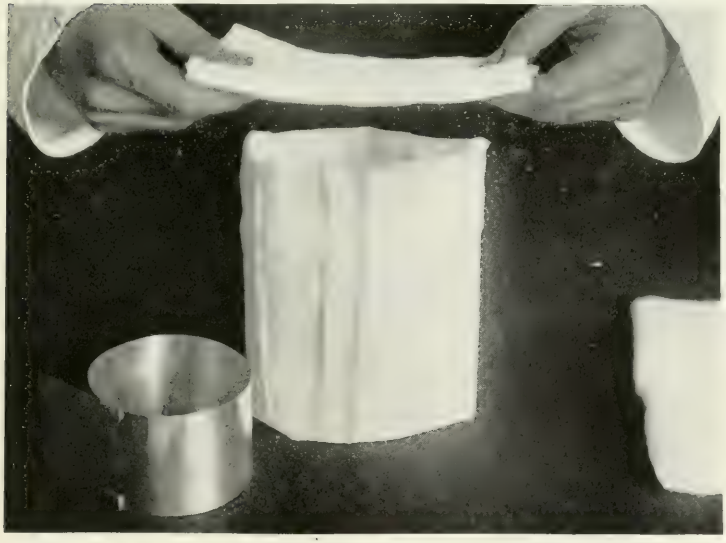
With regret we turn from these scientific methods of ether administration and consider the other side of the question. A large proportion of all the ether administration in this country has been done with the closed cone. This cone is made in many different ways; for example, from a butcher's cuff, closed at one end and made air-tight with oiled paper and covered with a towel. A quantity of ether is poured into the cone, which is applied as tightly as possible to the patient's face. The patient naturally resents this treatment. The principal effect of the proceeding is to mechanically interfere with the respiration. The air necessary for life filters with difficulty through loopholes or around the edges of the cone. An article in the *Journal of the American Medical Medical Association,* July 1, 1911, recommended a modification of this method. The writer uses an ordinary Derby hat, made to fit the face closely by means of wet towels placed around the edge. It is impossible that one who had the slightest knowledge of the physiology of respiration or had once seen Morton's excellent ether inhaler could use such a method.

In 1860 Sir James Simpson introduced a method for administering chloroform, drop by drop, on a towel or handkerchief laid over the patient's nose and mouth. In this way the 2 per cent. vapor necessary for chloroform anæsthesia is readily maintained. It is a good, though inexact, method of administration. In 1893 Dr. Lawrence H. Prince advocated the same method for ether, and at the present time about one-half of all ether administration is carried out in this way. It might not be expected that the method which so readily furnishes the 2 per cent. chloroform vapor would answer equally well for the 15 to 30 per cent. ether vapor, and this objection soon appeared in practice. The open drop method was then modified by limiting the free supply of air by wrapping a wet towel around the face and confining the evaporating surface in this or in some similar

Fig. 1.

Morton's ether inhaler, bearing the following inscription:
"Wm. T. G. Morton to J. Mason Warren. Original Ether Inhaler. 1846."

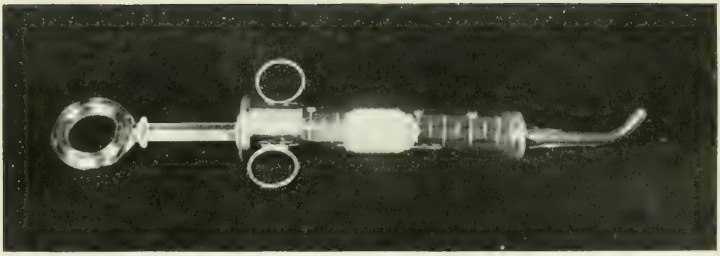
Fig. 2.



Preparation of the cone. The gauze diaphragm is being placed on the top of the cone. The metal ring is seen at the left and the gauze handkerchief at the right

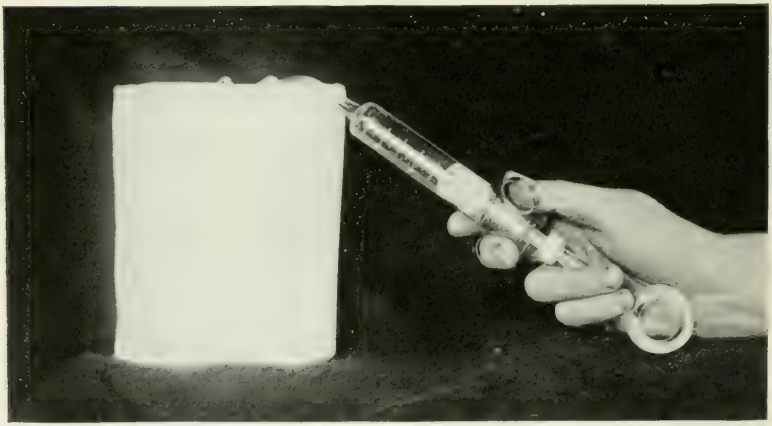
A detailed description of the cone is given in "Anesthesia," Gwathmey, Appleton, 1914, pp. 212–217.

Fig. 3.



The ether syringe, accurately graduated in drachms and half drachms and holding one ounce of ether.

Fig. 4.



Method of adding measured dose of ether to the cone from the graduated syringe.

way. Theoretically, a constant succession of drops of ether falls on the evaporating surface, and each drop is immediately vaporized. In practice the evaporating surface soon becomes chilled by the loss of heat from evaporation, and the drops of ether are not immediately vaporized, but may soak the evaporating surface, so that it no longer allows the unimpeded passage of air. Cold ether vapor is much more irritating to the respiratory passages than the same vapor is when warmed. One readily inhales a concentrated ether vapor at 95° F., while the same vapor at 45° F. is irrespirable by one who is conscious. The temperature under the mask in the drop method varies from 41° to 68° F.

The argument which is brought forward in favor of the drop method is the fact that it is extensively used. The only proper argument in its favor is the fact that by this method it is difficult to administer an overdose of ether. It is therefore of use when it is necessary, in an emergency, to entrust the administration to an unskilled person, also in clinics where it is not thought worth while to spend time in the proper instruction in anæsthetization.

On the contrary, besides necessitating the covering of the face and eyes and obscuring the information gained from observing the color and the eye reflexes, the method distracts the attention of the administrator from noting the condition of the patient. One who is conscientiously distributing a regular succession of drops of ether over the surface of a mask has no opportunity for observing the signs of anæsthesia, nor for making the record which is an essential part of the anæsthetizer's duties. The steady dropping of ether, maintained at such a cost, has no corresponding advantage. The successive drops are not immediately vaporized. Indeed, there are plenty of instances where the ether which has been carefully dropped runs down the patient's neck or into the eyes. To prevent conjunctivitis, the eyes are sealed with vaseline and covered with a piece of rubber tissue. Having covered the face so that changes in color are not evident, and having covered the eyes so that the lid and pupillary reflexes cannot be noted, the advocates of this method claim that it is unnecessary to observe these signs. The use of a surcingle to confine the knees, the practice of tying the hands, and the precautions against pouring ether into the eyes all serve as proofs that the administrators of the drop method themselves distrust their ability to secure an uneventful anæsthesia.

A steady succession of drops of ether is not the goal to be aimed at in ether anæsthesia. Instead, we try to add to the inspired air a constant yet variable percentage of ether vapor, gradually increasing to 30 per cent. by weight and then gradually dropping to about 15 per cent. The users of the drop method have no idea of the percentage of ether which is being utilized. They are fortunate if, at the close of the operation, they know how much ether has been made away with.

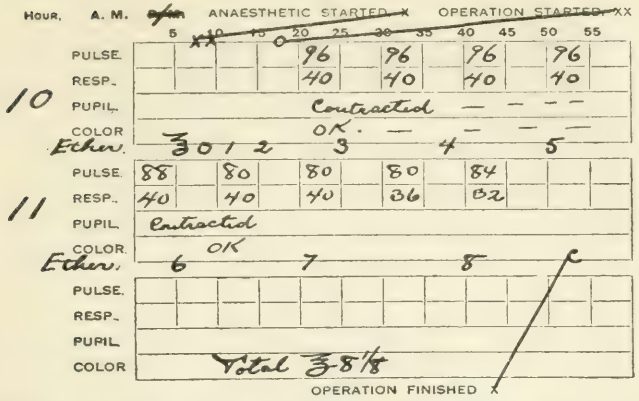
The method which I have to describe is too simple to attract immediate attention, but has proved uniformly successful wherever adopted. No ether is wasted. The ether is measured as used. Instead of proceeding in the dark, one may constantly know the amount of the anæsthetic which is being used, and may note the effect on the patient, gaining knowledge useful not only in the present case but for subsequent work. The apparatus consists of an open cone which has an evaporating chamber at one end and a graduated syringe. A fresh cone is used for each case. The cone is a funnel open at both ends, made from paper or pasteboard, and covered with a towel. It may be made from three sheets of newspaper folded to form a flat strip six inches wide. This is folded to form a funnel six inches long, with a breadth of six inches when flattened out. The funnel is neatly covered with a sterile towel. A diaphragm composed of eight layers of No. 1 surgical gauze, four by six inches, is placed over one end of the funnel. A strip of $\frac{28}{1000}$ sheet brass, nickel-plated, two inches wide and fifteen inches long, is bent to form a ring which is adjustable in size. This ring is sterilized by boiling. It is placed above the gauze diaphragm and pushed into the funnel to the full depth of the ring. The ring is pulled open as far as possible, fixing the diaphragm in the funnel. There is thus formed a chamber, its sides consisting of the metal ring, its floor formed of eight layers of gauze, and its roof free. A handkerchief of No. 1 sterile gauze, fourteen by thirty-six inches, is shaken out and placed in the chamber. The evaporating chamber is separated from the patient's face by an air space four inches deep. This air space provides a small proportion of rebreathing, which ensures the patient an unchilled atmosphere. A glass syringe with asbestos packing is provided with convenient handles and a special curved tip. The capacity of the syringe is 1 ounce or 30 Cc., and it is graduated in half-drachms (Figs. 2–5).

Administration.—The anæsthetic is preferably administered in

FIG. 5.

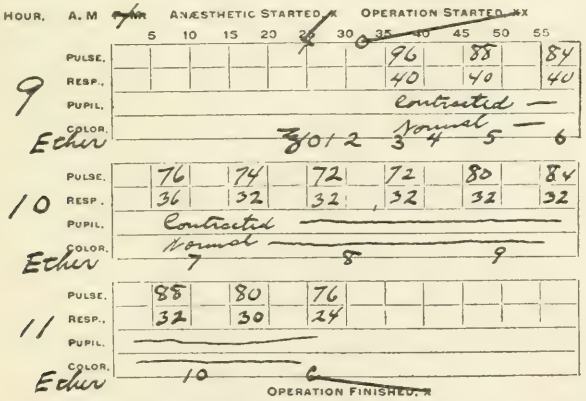
Open gas-ether. After securing gas anæsthesia, the inhaler is replaced by the cone and ether is administered in measured dosage. An approach to ideal anæsthesia.

FIG. 6.



PRELIMINARY EXAMINATION: Age—61. Previous anæsthesia—Gas for teeth. Dyspnœa—Considerable. Œdema—At times. False teeth—Upper set. Temperament—Nervous. Heart—O. K. Lungs—O. K. T.—Normal. P.—88. R.—20. Arteries—O. K. Hæmoglobin—Low. B.-P.—170. Urine—1025. No albumin. Sugar present. No acetone. Diagnosis—Carcinoma. Medication—Morphine, gr. $\frac{1}{4}$, atropine, $\frac{1}{150}$, at 9.15 A.M. OPERATION—Abdominal hysterectomy. Anæsthetic—Gas-ether. Amount—Oz. 8$\frac{1}{8}$. Position—Trendelenburg. O. R. Temperature—75° F. Ether rash to nipple line. No stimulation. Recovery—Good. Slight nausea. No vomiting. No post-operative complications.

In this case the first ounce of ether was used in 3 minutes, the second ounce in 4 minutes and the third in 10. The fourth and fifth ounces were used in 12 minutes, at the rate of a drachm every 1½ minutes. The sixth and seventh ounces were used in 15 minutes, at the rate of ½ drachm a minute. The eighth ounce was used in 20 minutes, at the rate of ½ drachm in a minute and a quarter. These measurements are in volume. Measurements by weight are one-third less, on account of the low specific gravity of liquid ether.



Case 2196.—PRELIMINARY EXAMINATION: Temperament—Steady. Age—41. Previous anæsthesia—Satisfactory ether a year ago. No dyspnœa, no œdema, no false teeth. Heart—O. K. Lungs—O. K. Arteries—O. K. Hæmoglobin—Normal. B.-P.—120. T.—Normal. P.—64. R.—20. Urine—1012. Normal. Diagnosis—Intestinal stasis. Medication—Morphine, gr. $\frac{1}{4}$, atropine, gr. $\frac{1}{150}$, at 9 A.M. OPERATION—For recurrent ileocæcal kink. Anæsthetic—Gas-ether. Amount—Oz. 10½. No stimulation. No rash. Position—Flat. O. R. Temperature—76° F. RECOVERY: Conscious at 12 M. Nausea—Slight; vomited once. No complications.

This patient took the first and second ounces of ether in 2½ minutes, the third and fourth in 5 minutes, the fifth and sixth in 8, the seventh in 12, the eighth, ninth, and tenth in 20 minutes each

the operating room, on the operating table. The room is quiet, no loud noise or conversation being allowed. Preparation of the field of opera-

tion during the induction of anæsthesia is not permitted. The patient is placed in a comfortable position, well covered, with one or two pillows under the head. The face is turned to one side. No surcingle or other restraining apparatus is used. An assistant stands ready to restrain the hands if necessary. The eyes are not covered.

The gauze handkerchief is drawn partly out of the chamber, leaving a clear airway at one end. A few drops of essence of orange are applied to the gauze handkerchief. The funnel is fitted closely to the patient's face, being readily pulled out to a larger size if necessary.

Ether is applied to the gauze in small amounts from the syringe until the patient becomes accustomed to breathing the dilute vapor. Then the gauze handkerchief is pushed back into the chamber so as to fill it lightly but completely, and ether is added in half-drachm doses until anæsthesia is complete. Each ounce of ether is indicated on the chart as it is drawn into the syringe. The cone is not removed from the face. The temperature in the cone, at an operating-room temperature of 76° F., varies from 84° to 90° F., depending on the amount of ether which is being vaporized.

Open gas-ether is the most satisfactory method for routine anæsthesia in private practice. The cone and syringe are prepared as for administering ether alone. The gas inhaler is fitted to the patient's face, and he takes one or two breaths of air through the air valve of the face-piece. The gas is then admitted, and a drachm of ether is poured on the gauze handkerchief in the cone. At the first sign of gas anæsthesia the inhaler is removed and immediately replaced by the cone. Ether is administered rapidly enough to secure complete anæsthesia in from two to five minutes, and then more slowly throughout the operation.

The amount of ether used is best indicated on the chart of an actual case (Fig. 6). The amount used for the induction of anæsthesia is included.

Doubtless this method can be improved, but there is no more reason for returning to a method of ether administration with unmeasured dosage than there would be for using an unmeasured dose of morphine or strychnine. A striking circumstance is that a number of patients who have been called bad ether patients have proved good ones when etherized by this method.

THE PREVENTION OF SEVERE DEFORMITY IN POTT'S DISEASE

BY PERCY WILLARD ROBERTS, M.D.

Associate Orthopædist, Mt. Sinai Hospital, New York City

Whatever method of treatment may be adopted for tuberculosis of the spine, the desired object is prevention of friction and weight-bearing at the point of disease. This accomplished, nature in time walls off the affected area and reëstablishes a relatively efficient spinal column. Operative measures have in the past few years supplanted in some degree the older brace and plaster-jacket treatment, but there still remain a vast number of Pott's cases in which either the Taylor brace or plaster jackets are to be preferred.

The argument against the use of jackets, which for fifty years have been applied by the Sayre method of upright suspension, is the frequent development of deformity in cases where little or none was present at the beginning of treatment. The appearance of deformity is, no doubt, due to the fact that, while a jacket applied in upright suspension immobilizes the spine, it does not prevent telescoping of the body within the jacket when the patient stands erect, with the result that the diseased bone is subjected to a certain amount of pressure and consequent attrition. To overcome this difficulty in an otherwise satisfactory form of treatment, various means of producing hyperextension have been suggested, but none reduced to that simplicity or accuracy of control which would ensure their ready adoption.

It was found that in suspending by one end a slightly flexed carpenter's rule with some resistance at the joint and with a weight attached to the lower extremity it would not assume a straight line (Fig. 1). This illustrates roughly what occurs in a spine afflicted with Pott's disease when the patient is placed in the Sayre apparatus. Obviously, however, if the same rule is suspended at the joint and very little weight placed at either end, hyperextension will readily occur (Fig. 2).

So I decided to adopt this principle in the treatment of Pott's

disease. Its application was effected by means of an apparatus called the "jack and sling" (Fig. 3), which consists of an automobile jack, to which are added two foot-pieces and an upper horizontal bar with a light canvas sling suspended from it, as shown in the illustration. With the patient lying upon a table, the sling, well padded, is passed under the back at the level of the involved vertebræ. As the jack is set in motion the diseased area becomes a fixed point, the distal ends of the spine falling away from it (Fig. 4) and opening a gap between the vertebral bodies, as shown in Fig. 5. Plaster is then applied in the usual way. Because of the arc formed, the body cannot telescope within the jacket when the patient stands (Fig. 6), so the desired relations between the vertebral bodies are maintained and pressure upon them prevented, allowing the natural reparative powers of the body to be exerted in maximum efficiency. It is customary to change the jackets every six or eight weeks for the first year, and the results obtained during the past four years have been very gratifying. Cases so treated have shown that gross deformity can be prevented and the period of treatment somewhat shortened, while the formation of abscesses was much less frequent (as indicated in a series of about fifty cases) than would occur in the older forms of treatment. Some have shown a distinct recession of deformity, but the value of the "jack and sling" treatment lies not so much in the possible improvement of some kyphoses as in the prevention of severe deformity when the cases come under early observation. Its field of service includes lesions below the seventh dorsal vertebra, and embraces, therefore, the great majority of all cases of Pott's disease.

The comfort of the patients as well as the ease of handling them on this apparatus is very striking. Not infrequently little children have gone to sleep while the plaster was being applied, and Fig. 7 shows an adult with complete paraplegia, whose jacket was put on without the aid of an assistant—an impossible achievement by other methods. What may be accomplished by the "jack and sling" treatment is shown in Figs. 8, 9, 10, 11, 12, 13, and 14. After a year and a half of treatment, jackets were in these cases discontinued and Taylor braces substituted for a year more as a matter of precaution against injury and relapse. The results in all early cases thus treated have been quite as satisfactory as in those chosen for illustration, indicating that the prevention of severe deformity is entirely possible.

Fig. 1.

Fig. 2.

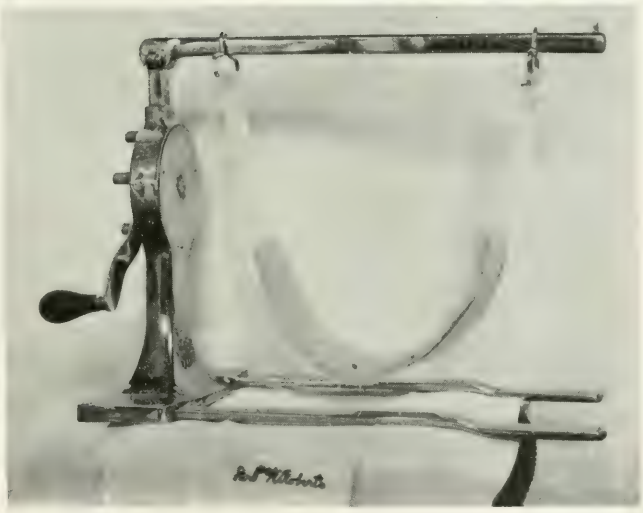


Fig. 3.

Fig. 1.—Rule in upright suspension.
Fig. 2.—Rule in horizontal suspension. Before and after applying weights.
Fig. 3.—Roberts's jack and sling.

Fig. 4.

Fig. 5.

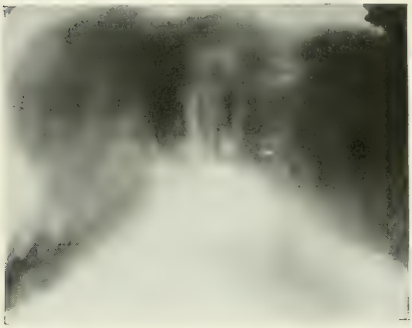


Fig. 6.

Fig. 4.—Patient on jack and sling, ready for jacket. Note hyperextension of the spine.
Fig. 5.—X-ray taken while patient was on the jack and sling, showing separation of the vertebral bodies at the apex of the arc.
Fig. 6.—Jacket applied, showing erect attitude.

Fig. 7.

Fig. 7.—Jacket applied on paralytic adult, showing hyperextension.

Fig. 8.

Case 1.—Twelfth dorsal, first lumbar, Pott's disease, before treatment.

Fig. 9.

Case 1.—A year after treatment.

Fig. 10.

Case 2.—Pott's disease, tenth dorsal, before treatment.

Fig. 11.

Case 2.—After treatment.

Fig. 12.

Case 3.—Pott's disease, first and second lumbar, after treatment. Kyphus much improved.

Fig. 13.

Case 4.—Pott's disease, eighth dorsal, after treatment. Kyphus much improved.

Fig. 14.

Case 5.—Pott's disease, first and second lumbar, after treatment. Very slight deformity.

THE LONDON CLINICAL CONGRESS OF SURGEONS

BY E. DUNBAR NEWELL, M.D.

Chattanooga, Tennessee

The first, the last, and the lasting impression of the Clinical Congress of Surgeons, held in London from July 27 to August 1, is Sir Arbuthnott Lane. Mr. Lane's operating room at Guy's is very small and far inferior, in general, to the usual operating room in the United States. There were about one hundred Americans present for the first operation, and during the eight times that Mr. Lane held clinics his amphitheatre was filled to capacity; and, as there was only one ticket issued for Mr. Lane's clinics, there must have been eight hundred or more Americans who saw and heard Mr. Lane.

Mr. Lane operated with the same beautiful regard for tissues and with the same perfect aseptic technic that he did in New York, when the Congress was held there in 1912. If Mr. Lane has done nothing else for American surgery, we owe him a debt of profound gratitude for impressing upon us that all the tissues must be handled with the greatest gentleness; and, to obtain the required asepsis in bone surgery, that the tissues must not be handled even with the gloved hand—but only with instruments—and that these must be frequently resterilized.

Mr. Lane does his colostectomy for intestinal stasis in from fifty to sixty minutes, and he does his major operations so quietly and easily that they seem in his hands very simple; in fact, too simple, as I dread to think of the fatalities that will follow this operation in America. Mr. Lane is best, far best, when he is operating. Then he is the master surgeon. But when Mr. Lane talks, although you are under his spell for a time, the bubble soon bursts, and you go away feeling so sorry that another great man has been carried beyond the limit of common sense by the intensity of his specialization.

Mr. Lane claims in positive terms that he can cure pulmonary and bone-and-joint tuberculosis by removing the colon. He claims that

arthritis deformans is perfectly amenable to treatment by removing the colon; that he has cured organic heart disease by the same operation. The impression given over and over is that the operation of gastrojejunostomy is useless, that it should be a colostectomy; that removing the thyroid for hyperthyroidism is operating on the end result and not the cause: that the proper operation is removal of the colon, as it is intestinal stasis that causes the trouble. He says there are only two remedies left in the pharmacopœia—liquid paraffin and the knife: all else are useless.

Mr. Lane uses liquid paraffin, liquid albolene, very extensively for intestinal stasis. He gives one-ounce doses a day whenever there are any indications of stasis. He says that all the nurses and employees of Guy's Hospital take liquid paraffin regularly, and in this way they avoid having their colons removed. He says they never require any other medication.

Mr. Lane says that every fracture that is plated—if it is done properly and there is no infection at time of operation—should be successful, and that the plates do not have to come away. Whenever a plate irritates and has to be removed, that indicates positively that the operation has not been done properly. Many English surgeons who have followed Mr. Lane's cases do not agree with him in this statement.

All tuberculosis is due to intestinal stasis—even bovine tuberculosis—according to Mr. Lane. Sir Berkeley Moynihon, in a very witty criticism of Mr. Lane at the Friday night session of the Congress, remarked that in his journeyings through cow pastures he had not been impressed that the cows suffered from intestinal stasis.

Mr. Sherren, operating at the London Hospital, made you feel as if you were in America: the appearance of the operating room, the little details, generally impressed you that there was a close association between England and America. To further impress this feeling, Mr. Sherren used Crile's anoci-association in all of his operations. Mr. Sherren is a marvellously fast operator, and at the same time he operates with the greatest regard for asepsis and neatness and does all of his work well, without the appearance of haste. He did an appendectomy in seven minutes, closing the incision himself. He did a gastrojejunostomy in fifteen minutes, and completed the entire operation within this time himself.

Mr. Sherren operated on one case for stones in the gall-bladder that had been diagnosed with the X-ray—the shadow showed up very prettily in this case. Mr. Sherren told his clinic that the X-ray that had been done for him to diagnose duodenal and gastric ulcers had been very unsatisfactory, and that it had aided him very little in his diagnosis of these conditions. In punched-out, extensive ulcers or in perforations the X-ray always diagnosed the conditions, but that these were the cases that could always be diagnosed without the X-ray.

In his gall-bladder operations he uses a rubber catheter, and sutures it directly in the bladder, and does not attach bladder to peritoneum, but allows it to drop back into cavity. In one of his gall-bladder drainage cases he attempted to remove the appendix through the incision, but, finding it somewhat difficult, he closed the incision and made another incision over the appendix.

Mr. Victor Bonney and Mr. Comyns Berkeley operated at Middlesex Hospital, and have a most ideal and up-to-date operating room. The same can be said of this operating room as was said of Mr. Sherren's operating room at the London Hospital. They are both clever operators, and, operating together as they do, I have never seen prettier work done anywhere. The one and only criticism I could make of these operators was the way they handled the intestines. Instead of packing back the intestines, they were pulled out and left outside the cavity, all during the operation. It was a case of cæsarean section, with living child, and a Wertheim operation. The patient had been treated by radium for carcinoma of the cervix, with good results, and they were afraid to allow the pregnancy to go to full term, for fear the cancerous condition would return and would grow rapidly. In both of the hysterectomies I saw them perform they used a double silk to ligate the vessels. In both instances they filled the cavity with hot saline solution before closing.

Mr. Percy Sargent, operating at the National Hospital, had an unusually poorly equipped operating room, but the work he is doing there certainly deserves a better equipment. He removed a cervical rib in fifteen minutes, and did it without the least traumatism to the tissues. He does an unusually pretty decompression operation on the skull. He makes four small trephine openings, connects the four openings by sawing through the outer table, slanting inwardly;

then he breaks through the inner table with one firm stroke of the chisel. In this way he has a bone-flap that can be replaced, and no amount of pressure on it can injure the soft brain tissues below.

After removing a large tumor of the brain the hemorrhage was so severe that it could not be controlled, except by firm packing with gauze, so he replaced the bone-flap and sutured the scalp completely without drain. The packing not only controlled the hemorrhage, but it kept the blood-pressure up by exerting the same cerebral pressure that the tumor had made. The packing was removed after three days.

Mr. Edwards and Mr. Freyer, operating at St. Peter's Hospital, have also an unusually poorly equipped operating room. They are both wonderfully dextrous in doing suprapubic prostatectomies, and the ease and quickness with which they do this operation, and the very slight hemorrhage that occurs, certainly impress one very markedly with the advantages of this operation for prostatectomies.

They perform their suprapubic operation as follows: The bladder is filled with boric solution; the operator cuts down on bladder, beginning skin incision two inches above pubis. When he gets down to prevesical fascia the bladder is distended further with the boric solution; he then peels with his finger the fascia from the bladder and shoves fascia and peritoneum up out of the way. The knife is then plunged directly into the bladder. With the finger of his left hand in rectum, the ungloved index and middle fingers of his right hand on bladder, he cuts with the finger-nail the mucous membrane until the cleavage plain is found, and then the prostate is quickly removed. Immediately after removal of the prostate the walls of the cavity are massaged together to prevent hemorrhage. The operator puts in small drainage for twenty-four hours in prevesical fossæ. He does not put any sutures into bladder wall at all. He sews up skin and fasciæ with catgut and silkworm gut; puts in three-fourths inch drainage for four days, then passes a small drain into large one and removes the large drain. The small drain is kept in for thirteen or fourteen days. He never allows patient to urinate under thirteen days, as the contraction of the bladder might cause secondary hemorrhage. He washes out bladder with H_2O_1 solution night and morning while drain is in bladder.

On the first day of the session of the Congress there was posted

for operation in the London Hospitals 135 operations in general surgery and an equally great number, proportionately, for gynæcology, obstetrics, orthopædic surgery, surgery of the nose, throat, and ear, and surgery of the eye. Besides these operations, there were special demonstrations on peritoneal adhesions, radium, X-rays, various demonstrations at the Royal College of surgeons, latest method of injecting neo-salvarsan, etc.

The American surgeons can never properly thank the London profession for providing these great and varied clinics, and for the mammoth task in organizing and systematizing these clinics for use and pleasure. The operating surgeons and their assistants and the hospital employees were unusually courteous and polite to the visiting surgeons. The surgeons and their assistants were more than forbearing and considerate when the almost impolite visitors would whistle down to an assistant who would obstruct their view; but invariably the surgeon would smilingly acquiesce, even if he had to be deprived of an assistant.

The hospitals in London, although all are charity and are maintained by popular subscriptions, are, as a class, better kept than American hospitals of the same class, and absolutely far better than municipal hospitals in America, and their maintenance, *per se,* is far less. One of the neatest, cleanest, best systematized and best equipped hospitals that I have ever seen is the Royal Liverpool Infirmary, and, although it is a 300-bed hospital and has every modern appliance, it costs for maintenance, including everything, only four shillings per day per bed. I spent some time under the care of the most courteous superintendent, going through all its departments, and was especially impressed with the fine work that was being done there in its X-ray department. Here the physicians felt that they could diagnose very early cases of gastric and duodenal ulcers, and I was shown many cases where their diagnosis had been confirmed at operation. They have been using radium for over a year, and they have a large supply; but they told me candidly that they had not gotten any satisfactory results in a single case of cancer of the uterus, vagina, bladder, or rectum. In epitheliomas of the face their results have been uniformly good: no case failed to disappear under the exposure to the radium. Most cases required only one exposure of 7½ hours, and some required two exposures at 30-day intervals, but very few required three exposures.

The most universally criticised person in the London operating rooms is the anæsthetist. In some clinics the anæsthesia is good—just as good as the American clinic; but, as a rule, the anæsthesia is very poor, and reminds one of the old chloroform days, with green internes, who were constantly giving the patient either too much or not enough of the anæsthetic. The quiet, undisturbed ether anæsthesia given by an expert is uncommon in the British hospitals. We saw some brilliant operators at the London clinics, but we saw many very indifferent operators, and so many operators were so very careless of their asepsis—far more so than in America.

The most striking feature of the British hospitals is the lack of sectarian or private hospitals for the accommodation of those who are able to pay. All of the hospitals are built for the poor, and these beautiful hospitals that are found all over England and Scotland are wonderful monuments to the great generosity of the English people. But one is surprised how poorly the well-to-do are treated: those who are able to pay must go to nursing-homes; there is no provision for them at any of the hospitals. The nursing-homes are very inferior private hospitals that are usually managed and conducted by a nurse, with sometimes the aid of an undergraduate or a graduate interne. They have a capacity of from fifteen to twenty-five beds, with very few of the modern conveniences that are found in the well-appointed private hospitals in America. Their operating rooms are usually very small and unusually poorly equipped as compared to our American places of this class.

The big sectarian or school hospitals that are used for both pay and charity cases are not seen at all. Their poor are certainly far better cared for than ours are; the well-to-do are able to look after themselves; and they certainly have none of those disgraceful municipal hospitals, reeking with graft and disorganization, that are so common in America. America would do well to imitate the cleanliness of London. Although the session was held in the midsummer season, there were so few flies that screens were not seen anywhere in London, and they were unnecessary. The death-rate from typhoid fever in London last year was only three per 100,000 population.

Medico-legal

EXPERT TESTIMONY

BY JOSEPH E. WILLETTS, M.D.

Chairman of the Commission on Medical Expert Testimony of the Medical Society of the State of Pennsylvania; Fellow of the American Academy of Ophthalmology and Oto-Laryngology; Fellow of the Pittsburgh Academy of Medicine, Pittsburgh, Pennsylvania

It is on record that medical experts testified in the courts in the year 1353, and it is reasonable to suppose the term "expert" was applied to them by the court, since judges and attorneys still claim the prerogative of so designating an ordinary witness when fancy dictates.

The absurdity of considering medical practitioners of that time as "experts" is apparent, seeing that the circulation of the blood was then unknown and the body structure, even the gross anatomy, as great a mystery as the composition of the stars that gleam and glisten in the silence of the night. Yet the testimony of those men has been perpetuated to the present time as medical expert testimony, and is reproduced to-day as an example of it when it is intended to hold such testimony up to scorn. Most articles on this subject, written from a legal standpoint, stigmatize the medical profession as a whole by quoting some ridiculous statement attributed to an "expert" when on the stand, or by pointing out some glaring instance where it was plainly apparent that the size of the fee was contingent on the character of the opinion to be expressed.

Many attorneys do not, or will not, realize that such medical men are quacks, not members of medical societies, and are outside the medical profession. That coalition between a certain class of attorneys and a certain class of medical men exists seems well established, and is apparently tolerated by the courts.

The medical profession ostracises and prosecutes the quack. The legal profession clothes the shyster with the respectability incident to membership in the County Bar Association, thereby obliterating any distinction between them.

Personally I have never known an attorney to be debarred from the practice of law until he had been convicted of crime or received a jail sentence. The medical profession does not wait so long. The profession of law assumes the *doctrinaire* position that representative government, or law process of any kind, is a sacred thing, inviolate in its form and limitations, from the time of Simon de Montfort's Parliament down to the last session of the Legislature at Harrisburg. Under such doctrine progress is impossible. Is it to be wondered at that the advance made by the medical profession in modern times is not appreciated by the legal profession?

The medical expert is handled on the witness stand to-day in the identical way he was hundreds of years ago, when physicians practised unlicensed and without restriction. Medicine was then a profession based on theory, without basic principles or scientific truths for its guidance and uncontrolled by governmental regulations. A man's reputation doubtless often rested largely on the pathological specimens on view on his office shelves.

There never has been a law properly defining expert testimony. The expert is not recognized and has no standing in court, except by the indulgence of the judge, nor can he legally collect his fee. Politicians enact laws, which are known at the time to be unconstitutional, to serve a special purpose for some special individual or corporate body. Every member of the Legislature can propose as many measures as he pleases upon any subject he pleases, and the Speaker, who is elected for that purpose, places them all on an equal footing and refers them to committees appointed by him. The birth of the measure conceived for a selfish purpose becomes a law by such questionable methods, and the statute is inflicted on a fearsome public by obsolete methods, and guilt or innocence decided by means of a decadent jury system. The only interest the shyster attorney has in the case is a division of the spoils with the black-leg, who, on his advice, may have perjured himself to obtain a favorable verdict.

The jury system is of great antiquity, and, in the beginning, doubtless served the needs of litigants. As originally conceived it was

good, but it has now degenerated into a farcical travesty of the justice it was intended to foster.

The high places in the jury system are now sought and often filled by a "bunch of bums," who pillow their heads on the court-house steps, awaiting the call of their master for jury service. I do not profess to know much about law, but, being a physician, I recognize a festering sore.

The effective work of the wrongdoer is manifest in the court-room of all cities throughout the country. Subornation of perjury is a common practice, often engineered by conscienceless attorneys. Secure against interference from within the precincts of the "Temple of Justice," the legal profession calmly sits by, heedless of the frowns of the Goddess of the Scales.

Exempt from criticism, regardless of the character of the colossal questions requiring the arbitrament of courts of justice, they continue to worship their fetish in the same old way. Court methods do not advance in keeping with general progress. New laws are enacted, but the method of their administration does not comply with the new and highly-complicated series of problems resulting from the equally new and complex industrial and professional civilization of to-day.

A new law, clean, logical and just, having for its object the welfare of civic righteousness, is looked upon as Utopian and unpractical. But such a law, constructed for effective good, though it might be drawn and framed by an ethical and able jurist, would not meet with general approbation by the legal profession, because it would naturally be constructive, incontrovertible, and necessarily restrictive in character.

The advancement in medicine and in the sciences intimately related to it has been phenomenal. The wheat has been gleaned from the chaff. Theory and empiricism have been eliminated by searchers after truth for truth's sake, so that now the marvellous intricacies of the human body are known to the surgeon as intimately as is the time-piece to the watchmaker.

Earnest investigators, searching for new remedies in chemical laboratories for the benefit of the human race, revealed many new agents. Consider, for instance, the revolution that has been brought about by the discovery of chloroform, ether, cocaine, and other anæsthetics. The surgeon of to-day can anæsthetize any portion of the

body with cocaine, or the major part of the body, with consciousness remaining, with stovaine; or the whole body with the patient unconscious by chloroform. These discoveries were closely followed by a recognition of the value of antisepsis, and that flash from heaven, the Röntgen ray. Pathological and clinical laboratories gave us knowledge of the oxygen-carrying power of the red corpuscle and the phagocytic action of the white one.

Abdominal surgery was a sealed book before antisepsis and asepsis, and wounds and operations of the abdominal cavity were universally fatal. The abdomen is now opened safely for diagnostic purposes. Internal organs are successfully spliced or excised. Typhoid and diphtheria are no longer to be feared. Medicine is all new.

If to-day any physician were to professionally treat an attorney as all patients were treated one hundred years ago, he would not only be sued for malpractice, but convicted as well. The medical profession, by a diligent and unselfish search for truth, has discovered so many basic principles and scientific facts that the profession itself is scarcely awake to the marvellous accomplishments and the sudden leap from darkness to the foremost place of scientific attainment. It has done more than discover principles. The knowledge that a proper lens will accentuate vision is of no benefit unless the lens be supplied and applied, and the medical profession has not only made discoveries but applied them in a practical fashion, in the form of filtration plants, vaccines, antitoxin serum, and many other ways, presenting them to the people unpatented and without the exaction of royalties. Medicine stands to-day upon the broad plateau of enlightenment, and deserves a generous gratitude for services nobly performed, instead of character assassination. It is not consistent with the dignity of the profession to sit by apathetically and not resent the criticism which appears daily in lay, medical, and legal journals.

In the *Saturday Evening Post,* a publication with a circulation of nearly two million, Dr. Edwin F. Bowers sums up the conditions surrounding expert testimony in these words: " Expert medical testimony has become a joke and a byword in every community where it has been exploited."

There is a crying need for a change that shall do away with the horrible farce for which the medical profession is itself to blame. Its members who have appeared as expert witnesses have brought upon

the whole profession the scoffing and contumely of all who follow their devious evasions, their lack of unanimity. It is notorious that one can buy almost any and all kinds of expert testimony for which one has the money to pay.

In the *Pennsylvania Medical Journal,* Francis Fisher Kane, of Philadelphia, in a paper read by invitation before the Pennsylvania State Medical Society, says:

" For the last quarter of a century and more the medical and legal professions have been discussing the abuses of expert testimony and the means of remedying them. Many papers have been written, and there is now an extensive literature on the subject, but the abuses are with us still. Can anything be done to lessen them? The question will not ' down '—I need not dwell on the abuses of expert testimony as at present given. You know them as well as, if not better than, I do.

" The point I would have you note is that, after years of agitation and debate, after repeated homilies from your profession and mine, after various proposals of reform, none of which has been carried out, expert testimony is still in the mire. It is belittled and reviled by lawyers, judges, and jurymen alike. The public takes it as a joke, and such it would be, but for its tragic side."

Of an expert who testified before him in the Tracy Peerage case, Lord Campbell said: " Hardly any weight is to be given to the evidence of what are called scientific witnesses. They come with a bias on their minds to support the cause in which they are embarked."

The existing grievances concerning expert testimony, while due to several causes, are mainly owing to unrecognized conditions. One hundred years ago there was not a man in the medical profession who was an " expert " in any sense of the word. They were called experts, just like the man, who was the worse for drink, who said to the bell-boy, " Call me a taxicab." The bell-boy said, " You are a taxicab "; but he was not one any more than these men were experts. Seventy-five years ago there were not fifty trained nurses in the land. Since that time the medical profession has educated a hundred thousand of them, any one of whom knows more than any two doctors did then.

What, we might ask, is there new in law since the adoption of the old English common law, and, for that matter, three hundred years before?

The proper adjustment of medical expert testimony should, in all justice, originate within the legal profession, but, for the various reasons before stated, it assumes the garb of a specific duty of the medical profession. It is a bypath of medicine just as important and vital to the integrity of the profession as ethics, split fees, or the social evil, to which it is now giving its attention.

It is a difficult matter to frame laws which will be adequate. Legislation, to be thoroughly effective, must be based on, or proceed along, logical lines of equity. No equitable adjustment on conventional lines can be adopted or enacted into a law unless it be based on facts. Therefore, laws, to be beneficial, must be especially designed for the protection of the public at large, and be based primarily on fact, equitably constructed. No single radical law will avail. The evolvement of the Initiative, Referendum, and Recall, by lay minds cognizant of the present-day court abuses, and supported by such a notable and able man as Theodore Roosevelt, will accomplish nothing in the way of correction.

The recalling of a judge or a municipal official is of little value, since their recall and reëlection are accomplished by a majority vote of the people, whose approval or negation can be swayed by paid orators in the employ of the interested parties. The Mayor of Seattle, who was elected by the people, was recalled by the people and again reëlected by them. It can hardly be said that the experience thus far gained in the actual operation of the Initiative and Referendum is sufficient to warrant many dogmatic conclusions. However, we must remember that it is the voice of the people in their desire for civic betterment.

For this reason these laws have a deeper significance than superficial study of them would indicate. They are the direct expressed opinion of the people, a notice served by them to the courts, against present-day methods, a notice against subornation of perjury, and a notice to the members of the Legislature against political prostitution. They are a protest served upon the courts against the packed jury: they are the handwriting upon the wall. The recall of an official is the least thing connected with them.

The relative position of law to medicine constitutes an obstacle to progress. New medicine has a new position, which must be recognized and impressed on the lay mind. The situation at court for the

expert will be improved so soon as a law is passed which will definitely state that it requires more than a diploma to pose as an expert.

The following suggestions by Judge G. A. Endlich, of Reading, are commendable because of the good results which might ensue should they be adopted, and they should be because of their simplicity and practicability, and because they in no way conflict with the Constitution:

"1. The formulation of a stricter definition of expert capacity.

"2. The reasonable limitation of the number of experts to be called in any case.

"3. The designation of such experts by the court upon nomination by the parties.

"4. The abolition of the hypothetical question.

"5. The summoning by the trial judge of an expert of his own choice to serve as assessor, or as a witness to review the expert testimony already in, or as both.

"6. The payment of expert witnesses out of the public treasury, at least in the first instance.

"No one of these measures can be expected to accomplish all that is desirable. If the probable effects of each have been correctly foreshadowed, then collectively they would come very near doing so."

An expert must be a specialist, and the value of his opinion proportioned to his character and standing in the community, as well as in his specialty; he must be honest as well as wise. The formulation of a stricter definition of expert testimony is an absolute necessity. The present method of permitting any one who has a diploma to pose as an expert is a snare for the profession. To be an expert, one must be well informed in his principal vocation, and the said expert is in no way qualified to testify in any other specialty than his own. An expert is as ignorant in other specialities as the judge, the jury, and the attorneys are ignorant in the one in which he is testifying. We select men in our own specialty for consultation. An oculist would not call in consultation a pathologist or neurologist any more than a chemist would need the opinion of an oculist. Why, then, should we permit attorneys to continue this juggling of medical men on the witness stand, when the evidence so often concerns the property, the sanity, or the very life itself of men and women?

Article 1 of an act, which has been adopted by the Commission

on Medical Expert Testimony and accepted by the Pennsylvania State Medical Society, is as follows:

"1. No person shall be eligible or permitted to testify as an expert in the trial, hearing, etc., of any auditor, etc., acting under appointment of any court or judge, unless it be first shown to the satisfaction of such court, master, auditor, etc.,

"(1) That the subject-matter concerning which he is so to testify is fairly within (*a*) his present principal avocation in the locality in which he follows the same, or (*b*) the operation of an invention made by him and reduced to actual working, or (*c*) a line of study or investigation, not ordinarily pursued as a distinct profession of business, in which his researches have been systematic or his opportunities for observation exceptional;

"(2) If the question involved be one of purely abstract science, that his experience has been both practical and theoretical;

"(3) If the subject is one of professional study or science, that he is familiar with the most advanced learning upon the same;

"(4) If, in the locality in which the proposed witness resides or follows his avocation, or where the trial, etc., is had, the subject is one generally pursued as a medical, surgical, or pathological specialty, that he presently so pursues it;

"(5) That he has not been approached, consulted, employed, or paid with reference to the trial on any questions involved in it, by either party to the same, or by any one in behalf and by authority of said party, nor (except by way of authorized report to the court) expressed an opinion concerning any such questions as applicable to the case on trial."

The above article of a proposed act to govern expert testimony specifically defines what constitutes an expert, and in itself would do away with hundreds of damage suits, filed by malingerers, through attorneys on a contingent-fee basis. It would also do away with the professional medico-legal parasite who testifies as instructed by the attorney.

Opinion-evidence is only obtainable from a matter-of-fact witness, and, as these men could not qualify as a matter-of-fact witness, their value to the contingent-fee attorney would be *nil*.

The contingent-fee system is a menace, not only to every corporate body but also to every practising physician. Hundreds of malpractice

suits would never be entered were it not for the attorney, who, having nothing to lose, threatens suit for a settlement and divides the proceeds with the malingerer. This reprehensible system, demoralizing to society generally, is to the medical profession a menace. Why create medical defence funds for protection against this abuse when the cause which makes the fund necessary can be removed by practical legislation and the whole nefarious system be abolished?

The number of experts in any given case is not a vital question, but the manner of selection is all-important. Attorneys should have no voice in it until after their nomination by the plaintiff and the defendant.

Physicians recognize the right of a patient to suggest a consultant, and his acceptance is subject to the approval of the attending physician. Just so is it the inherent right of the plaintiff and defendant to suggest or nominate the expert, his acceptance being subject to the approval of the judge and the attorneys, as proposed in Article II:

"ARTICLE II.—Whenever, in any case to be tried, etc., or on trial, etc., before such court, master, auditor, etc., it shall be desired by both parties, or by either party, to introduce expert testimony, the parties, or either party upon notice to the other, may apply to the court, or a judge therein; such application, if the purpose to introduce expert testimony exist in advance of the trial, etc., to be made a reasonable time prior to the date for which it is set down, and, if not, then as soon as it is formed in the course of the trial, etc.,—the application, moreover, to be in writing and filed of record and to set forth the nature of the subject of inquiry with sufficient precision to indicate (1) the admissibility of expert testimony, (2) the limits of the inquiry proposed, (3) the science, art, trade, department, branch, or specialty in which the experts chosen ought to be skilled. Supposing the subject to be one proper for expert testimony, if the parties agree with each other as to a number of persons acceptable to both, and their counsel so certify the court, the judge, unless aware of sufficient grounds for the rejection of them, shall designate from among them a proper number, not less than two nor more than four; with this proviso, that either party may waive the right to call expert witnesses, in which case but one appointment shall be made from a list to be submitted by the party desirous of calling such, and that if the parties expressly agree to have but one expert, naming him, and he shall

be unobjectionable to the court or judge, he shall be designated. If the parties neither waive nor agree, or if their agreed list does not enable the court or judge to select two names, each party shall hand in a list of his own, and from each list the court or judge shall designate one or more (not exceeding three), being at liberty to call upon counsel for such information concerning the character, qualifications, etc., of any of the persons named as shall appear desirable in order to a proper selection; to reject, for reasons sufficient in his judgment, all the names on either or both lists; and to call for new nominations accordingly. All agreements as to the selection of experts and all lists of nominees for that purpose shall be accompanied with the affidavits of the parties and the certificates of their counsel—the former declaring that none of the persons named have been approached, consulted, etc., by the affiants or any one in behalf and by their authority with reference to the case, and the certificates of counsel similarly declaring as to themselves. The names of the persons designated by the court or judge shall be at once certified to the prothonotary or clerk of the court, who shall forthwith notify them of their appointment by the court, or cause them to be summoned, as the case may require, the notification and summons to be accompanied with an exact copy of counsel's statement as to the nature of the subject of inquiry."

Once expert testimony is properly defined and the expert designated by the court on nomination by the parties concerned, the character of the testimony must conform to, and be consistent with, the equitable adjustment so proposed.

It is the facts of a case which determine the issue. Hypothesis can have no legitimate place in testimony of any kind. The hypothetical question was invented for subterfuge alone. As it stands to-day it is contemptible and absurd in application. To demand of an expert who has summed up facts to negate his testimony by answering to a hypothetical question from one to two hundred thousand words in length, framed by an attorney in legal phraseology, is bitterly absurd because of the ulterior motive behind it. If a man's testimony of fact is such as to determine a case, the approving attorney may negate his testimony by the formulation of a lengthy hypothetical question.

There is no limit to its length or to its phraseology. Its main use is to obscure the main scientific issue by extravagant intricacies

of legal phraseology, and to throw discredit upon a man who refuses to answer in five minutes a question which took five hours to prepare.

Of course, the witness is privileged to demand a clear exposition of each part of the question, but if he be wise he will make no attempt to do so: it tends to invalidate his opinion. The following is a sample of a hypothetical question actually offered:

"Assuming the testimony of the previous witness, tending to show the circumstances, if any, leading up to the act, and tending to show the acts of the defendant, if any, in relation to the homicide to be true, and tending to show that the conduct of defendant, if in immediate connection with the act, was that or was not that of a sane man, as the case may have been, state whether in your opinion at the time he committed the act defendant was sane or insane."

It is the privilege of counsel to assume any state of facts which there is any evidence tending to prove. The fact that counsel makes an error in their formulation does not in any way make the question objectionable. The hypothetical question should be abolished in its entirety, or at least restricted to fifty words. It should be confined to a *résumé* of the facts as testified to, and should not be termed "hypothetical." The whole province of the expert is to state facts, not to win the case. It is not the duty of the expert to reconcile conflicting testimony. Once an opinion is formed from material facts, the expert has a right to frankly state, forcibly impress, and earnestly support it with all the knowledge at his command.

Public demand for the condemnation of the suborner of perjury should be so insistent that he meet with the same condemnation as that which now exists against the perjurer, and the penalty should be greater.

Investigation of court methods by some sociologic, municipal, or medical research foundation, clothed with the authority to kill lies, establish truths, and crystallize sentiment along definite practical lines, is as vital to the community as the social or any other evil which they may be engaged in suppressing to-day. An investigating body with the courage to investigate and with sufficient executive ability to pursue it in a systematic, non-sensational manner would reveal to the public gaze a quagmire of iniquity, ensconced, like a sleeping cobra, within the folds of the Constitution.

Law is not supreme if its enactment be accomplished through politi-

cal prostitution, nor is it exempt from criticism and indictment when in flagrant violation of good government. Article VIII provides in a measure for the corrupt practices now in vogue.

"VIII.—Any wilfully false statement in any affidavit required in this procedure shall be perjury in the party guilty of making it, and any attempt to approach or influence any person designated by the court as an expert witness or as an assessor, and any bribery of such, and any corrupt attempt to forestall the selection of persons as experts by engaging or consulting them with a view to making them ineligible as experts, shall be criminally punishable in the person making such attempts or offering or giving such bribes."

The enactment of a measure, such as is proposed by the Commission on Medical Expert Testimony, which space forbids my giving in full, would protect corporate bodies from unscrupulous attorneys, and close the wide-open door upon the crooked "expert." The medical profession is called upon oftener for expert opinion than any other, so it is well within our province and our duty not only to introduce proper legislation, but, by a concerted action of the entire profession, to demand, in an insistent way, a correction of the present obsolete methods, which are a disgrace and a blot upon civilization.

The legal profession is not inclined to do anything in the way of reform legislation for the governing of expert testimony, nor will they brook any interference from an outsider. "Go slow," they whisper, with warning hand on high. "Beware of constitutional amendment." "Let well enough alone." Why?

PERFORMING AN OPERATION WITHOUT CONSENT

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THE fundamental principles of law, making it necessary, certainly prudent and safe in every instance, for the surgeon to obtain consent before performing an operation on a patient, have been laid down by courts of last resort as follows:

"Under a free government, at least, the free citizen's first and greatest right, which underlies all others,—the right to the inviolability of his person,—in other words, the right to himself, is the subject of universal acquiescence, and this right necessarily forbids a surgeon or physician, however skilful or eminent, who has been asked to examine, diagnose, advise, and prescribe (which are at least necessary first steps in treatment and cure), to violate without permission the bodily integrity of his patient by a major or capital operation, placing him under an anæsthetic for that purpose, and operating on him without his consent or knowledge."

And again:

"Every person has a right to complete immunity of his person from physical interference of others, except in so far as contact may be necessary under the general doctrine of privilege; and any unlawful or unauthorized touching of the person of another, except it be in the spirit of pleasantry, constitutes an assault and battery."

The facts as they appeared in evidence at the trial, and the comments of the Appellate Courts in laying down and applying the law to such facts, in adjudicated cases, will serve to inform the surgeon as to his duties and rights and to safeguard his practice.

PERFORMING A MAJOR OPERATION WHERE THERE WAS CONSENT FOR A MINOR ONE ONLY

CASE I.—The consent by a husband to an operation upon his insane wife on taking her to a hospital is exhausted when the operation is performed and she is taken away, so as not to justify another operation if she subsequently returns to the hospital. Accordingly, consent by a husband to an operation upon his wife

for the removal of her uterus and ovaries is not shown by the fact that, after an operation for laceration of uterus to which he consented, but which did not prove successful, he complied with a request to bring his wife again to the surgeon for further treatment.

The wife, the patient, was about forty years old, and afflicted with epilepsy ever since she was a young woman. The doctor said to the husband of the patient that the extent of surgical interference to effect a cure was uncertain, his examination of the pelvic organs having disclosed that the uterus was small, that it was lacerated and pinched, and the condition of the last inch of the rectum was bad; that it might necessitate the removal of the organs before it was done with; but that the first thing to do was to loosen the hood of the clitoris, to dilate and curette and operate for the laceration of the cervix of the uterus, and to put the rectum in repair.

To the patient herself the doctor told only just enough to get her consent to be operated upon, that is, that the neck of the womb was torn and would have to be repaired. These were minor operations and much less serious and severe in execution than the removal of the uterus.

The surgeon seemed to consider the undeniable fact that the patient had epilepsy and wanted to recover from it as constituting an implied consent to anything he might choose to execute in the way of surgery, and as a sufficient justification for assuming her consent to a major operation, of the necessity or likelihood of which he did not inform her.

The patient went at once to the hospital of the surgeon, and the next day he performed the operation for the laceration of the womb, and the patient remained in the hospital about four weeks at this first visit. The surgeon did not claim that, during this visit to his hospital, he obtained the patient's consent to the removal of her uterus. He said, "I did not deem her worthy of that;" "she was unfit for it;" "her mental condition was such that it was impossible to take her into advisement on her own case." He told her it would be necessary to repair the tear in her uterus to cure her, and he told her this only because he wished her to come to his operating room without violence; that had she been a little more insane he would "have removed her to another institution and put her to sleep in a bed in a cell." "I thought that her mental condition was such that she could be influenced by what I told her to the extent of walking to the operating room instead of being carried." "I worked her deliberately, systematically, taking chances which she did not realize the full aspect of, deliberately and calmly deceiving the woman,—that is, I did not tell her the whole truth."

After a two weeks' absence from the hospital, upon being informed that the patient was no better, the surgeon told the patient's husband that it would be necessary for her to return for the "finishing work," to which the husband assented. The same day she returned to his hospital, the surgeon, while she was under the influence of an anæsthetic, removed her ovaries and uterus. While it does not appear whether the anæsthetic was administered with or without her consent, or while she was in her bed or on the operating table, the surgeon says it was not an uncommon practice to administer the anæsthetic to patients in their beds and then convey them to the operating room.

The testimony in behalf of both the patient and the surgeon excluded the existence of any consent, express or implied, on the part of the patient personally. The surgeon, indeed, disclaimed the express consent, and from his characterization

of the plaintiff's condition as that of one "wholly incompetent to reason" when she first came to his institution, and as "aggravated" when she came back for the second time, so that she was then insane—"emphatically," it is plain that he did not rely on any *implied* consent on her part; for he did not consider her competent to give one.

But the appellate court, apparently entertaining serious doubt as to the correctness of the surgeon's diagnosis of his patient's mental condition, thought it well not to neglect this hypothesis of a *personal consent implied from the patient's conduct.* For the appellate court went on to say: "If the patient did not personally consent to the operation which is complained of, then, under the doctrines which we have hereinbefore set forth concerning the rights of a citizen to inviolability of person, and concerning the duty and authority of surgeons, the defendant is liable to her in damages unless some controlling and superior authority rightfully empowered him to perform the operation."

The surgeon's defence was that the justification of the operation on his part springs from the consent of the husband of the patient, and that the husband had the controlling and superior authority. And these propositions he based on the allegation of the fact of the patient's insanity, and on the legal assumption that in such case, there being no other legally appointed guardian or custodian of her person, the husband was solely in control of it.

As to this defence, the appellate court said: "Without intending to lay down herein a rule to be quoted in subsequent cases, where perhaps it might seem as dangerous to recognize in a husband an unlimited right to expose, without her consent, the body of an insane wife to the surgeon's knife as it evidently is in the eyes of the legislature of Illinois to allow a husband the right to restrain such a wife of her liberty without a judicial inquiry into her sanity, we may assume, for the purpose of the present case, that, as the husband is the head of the family and naturally the protector and guardian of an insane wife's interests, consent by him, implied or express, would justify the surgeon and avoid the liability charged against him in this action. But it is obvious that to make good this defence, after it has been admitted or has otherwise appeared that no consent of the patient herself can be shown, the defendant must show two things affirmatively: First, that the patient was not mentally in a condition to be in control of her own body; and, second, that her husband consented to the operation. Upon the surgeon, as to these matters, lies the burden of proof."

As to the first point, the appellate court said: "We think the preponderance of proof was that she was, at the time this operation was performed on her, in such mental condition that she should have been consulted as to the operation and her consent obtained before it was performed. It being then conceded that no such consent was expressly given, and it appearing from evidence, in our opinion, that no such consent on her part was implied, we should not be able to disturb the verdict for the patient, however we might view the evidence concerning consent or the want of it on the part of the patient's husband. In our view, he could not, without the wife's acquiescence, control the integrity of her body."

As to the second point, evidence as to the husband's consent was conflicting: The surgeon said: "He gave me *carte blanche* to use my own discretion, excepting, of course, to do as little as possible." "I told him I hoped I would not have to do anything more than the first work; at the same time I would have

to have his free permission to do whatever I thought best for the case, or I would not have anything to do with the case, and to that he consented. That is the only time I talked to him about the matter." "The husband did not tell me at any time that he did not want any more surgical work done."

Explicitly denying this, the husband testified that the doctor, after an examination, said he thought he could cure his wife; that the uterus was lacerated and would probably have to be sewed up, and that after this was done at the patient's first stay at the sanitarium, and as he was taking his wife home, the doctor said there was some little irritation that needed further treatment and he would like to have her brought back after a week or two for such further treatment, when he thought she would be all right. Thereupon, the husband testified, he told the doctor that he objected to any further operations, and his wife also, in his presence, said the same thing; that she went back at the doctor's request because the doctor said "there was some little irritation that really needed further treatment."

The husband testified that he first learned of the serious operation of removing the ovaries when he returned from his weekly business trip; that his wife then informed him that the doctor had performed another operation on her against her wishes; that he went to the doctor and asked him what he had done and what he meant by doing anything of the kind, and the doctor answered him that he had removed the ovaries and uterus because he *thought* the patient wanted him to use his best judgment.

The patient's sister testified that when, after the operation, the patient complained to the doctor of what had been done, he said, "I did not think it was well to tell you; I consulted with your husband and he told me to do whatever I thought best." The patient inquired: "Doctor, when did you talk with my husband?" The doctor said: "When you came back here the other day,—this last time." The patient said: "You are telling what is not true, because my husband was miles away in C——; he was out on the road and did not come here with me." (This was a fact.) The doctor said: "It does not matter, anyway; I did it for your own good and I have done my part."

As to this conversation, the doctor testified: "I have done nothing I was not authorized to do;" and he would not agree with the patient's sister as to the details of the conversation.

The doctor's letter to the patient after the operation, and after a suit had been begun against him, makes no mention of consent or direction from her husband. He testified that "he did not remember whether she said in her husband's presence that she would come back again, but that she would not submit to any further operation,—that it might be."

When the patient went back to the hospital she was accompanied by her husband's brother, who had no authority to give, and gave no instructions or directions as to her treatment. The husband was away on a business trip. Both her sister and her husband had visited her when she was in the sanitarium the first time, but neither was present or near at the time the operation was performed, which, under the circumstances, was strange, if the husband's consent to a major operation had been given and such operation, therefore, might have been expected.

"On this state of the evidence," says the appellate court, "we are satisfied that the trial judge was right in finding that the preponderance of evidence on

this point of the husband's consent is that it was not given for this major operation.

"And our conclusion is, therefore, that, whether the evidence as above were to be considered as showing the patient sane or insane, she would in each case be entitled to recover damages. The verdict was for the patient for $3000 and costs in a trial before the judge without a jury.

It may be profitable, at this point, in connection with the testimony, to give the clear statement, by the Appellate Court, of the law defining the duty of the surgeon where unexpected conditions develop in the course of the operation, or an emergency arises, making it impracticable or impossible to obtain consent. Both contentions had been urged in behalf of the surgeon in this case, but the Appellate Court, in rejecting them, said: "Where the patient desires or consents that an operation be performed, and unexpected conditions develop, or are discovered in the course of the operation, it is the duty of the surgeon, in dealing with these conditions, to act on his own discretion, making the highest use of his skill and ability to meet the exigencies which confront him; and, in the nature of things, he must frequently do this without consultation or conference with any one, except, perhaps, other members of his profession who are assisting him. Emergencies arise, and when a surgeon is called it is sometimes found that some action must be taken immediately for the preservation of life or health of the patient, where it is impracticable to obtain the consent of the ailing or injured one, or of any one authorized to speak for him. In such event, the surgeon may lawfully—and it is his duty to—perform such operation as good surgery demands, without such consent. The case before us, however, does not fall within either of these two classes."

As illustrations of the superior authority which would justify an operation without consent of the patient, the court instanced the control which the State takes of persons under sentence for crime; the power which is vested in parents over minor children of tender age; and the authority given to legally constituted guardians of the person of those who are insane or imbecile; and, in a more restricted sense, in the marriage relation which makes the husband the head of the family.

If a soldier goes into battle with a knowledge beforehand that surgeons attached to the army are to have charge of the wounded, it may be considered as an implied consent for such operations as the surgeons afterwards, in good faith, performed.

PERFORMING A DIFFERENT OPERATION FROM THE ONE CONSENTED TO

CASE II.—An operation by a surgeon upon the left ear of a patient without her express or implied consent, after she had consented to an operation upon her right ear, was unlawful; and such conduct by a surgeon constitutes in law an assault and battery.

The evidence at the trial showed that the surgeon was a specialist of standing and character, making diseases of the ear his specialty, and having an extensive practice in the city of P——. The patient, who complained to him of trouble with her right ear, requested him to make an examination to ascertain its condition. He did so, and at the same time made an examination of the left ear, but, owing to foreign substances therein, he was unable to make a full and complete diagnosis at that time. The examination of her right ear disclosed a large perforation in the lower portion of the drum membrane, and a large polyp in the middle ear, which indicated that some of the small bones of the middle ear (ossicles) were probably diseased. He informed the patient of the result of his examination and advised an operation for the purpose of removing the polyp and diseased ossicles. After consultation with her family physician, and one or two further consultations with the surgeon, the patient decided to submit to the proposed operation. She was not informed that her left ear was in any way diseased, and understood that the necessity for an operation applied to her right ear only. At the hospital she was placed under the influence of anæsthetics; and, after being made unconscious, the surgeon made an examination of her left ear, and found it in a more serious condition than the right one. A small perforation was discovered high up in the drum membrane, hooded, and with granulated edges, and the bone of the inner wall of the middle ear was diseased and dead. He called this discovery to the attention of the patient's family physician, who attended the operation at her request, and who also examined the ear, and confirmed the surgeon's diagnosis. The surgeon also further examined the right ear, and found its condition less serious than expected, and finally concluded that the left, instead of the right, should be operated upon, devoting to the right ear other treatment. He then performed the operation of ossiculectomy on the patient's left ear, removing a portion of the drum membrane, and scraping away the diseased portion of the inner wall of the ear. The operation was in every way successfully and skilfully performed. It is claimed by the patient that the operation greatly impaired her hearing, seriously injured her person, and, not having been consented to by her, was wrongful and unlawful, constituting an assault and battery, and she brought action to recover damages therefor. The trial resulted in a verdict for the patient for $14,322.50.

The appellate court reversed the judgment entered on this verdict as being excessive; but, nevertheless, in view of the verdict for the patient, it regarded the above facts as proved, and, in commenting thereon, first, as to whether consent of patient was necessary, and, second as to whether the operation was consented to, said: *First.*—" We have given this case very deliberate consideration, and are unable to concur with counsel for the surgeon that the consent of the patient was unnecessary. The evidence tends to show that, upon the first examination of the plaintiff, the surgeon pronounced the left ear in good condition; and that at the time she went to the hospital to submit to the operation on her right ear, she was under the impression that no difficulty existed as to the left ear. In

fact, she testified that she had not previously experienced any trouble with the left ear. It cannot be doubted that ordinarily the patient must be consulted, and his consent given, before a physician may operate on him."

And the court after approval of the fundamental principles above laid down, continued: "The patient must be the final arbiter as to whether he will take his chances with the operation, or take his chances of living without it. Such is the natural right of the individual, which the law recognizes as a legal one. Consent, therefore, must be expressly or impliedly given before a surgeon may have the right to operate. There is logic in the principle thus stated; for, in all other trades, professions, or occupations, contracts are entered into by the mutual agreement of the interested parties, and are required to be performed in accordance with their letter and spirit. No reason occurs to us why the same rule should not apply between physician and patient. If the physician advises his patient to submit to a particular operation, and the patient weighs the dangers and risks incident to its performance, and finally consents, he thereby, in effect, enters into a contract authorizing his physician to operate to the extent of the consent given, but no further."

In behalf of the surgeon, it was contended that, under the facts and circumstances of this particular case, consent was implied; that it was an emergency case, such as to authorize the operation without express consent or permission. As to this the appellate court said: "The medical profession has made signal progress in solving the problems of health and disease, and it may justly point with pride to the advancements made in supplementing nature and correcting deformities, and relieving pain and suffering. The physician impliedly contracts that he possesses, and will exercise in the treatment of patients, skill and learning, and that he will exercise reasonable care, and exert his best judgment to bring about favorable results. The methods of treatment are committed almost exclusively to his judgment; but we are aware of no rule or principle of law which would extend to him free license respecting surgical operations. Reasonable latitude must, however, be allowed the physician in a particular case; and we would not lay down any rule which would unreasonably interfere with the exercise of his discretion, or prevent him from taking such measures as his judgment dictated for the welfare of the patient in case of emergency. If a person should be injured to the extent of rendering him unconscious, and his injuries were of such a nature as to require prompt surgical attention, a physician called to attend him would be justified in applying such medical or surgical treatment as might reasonably be necessary for the preservation of his life or limb, and consent on the part of the injured person would be implied. And again, if, in the course of an operation to which the patient consented, the physician should discover conditions not anticipated before the operation was commenced, and which, if not removed, would endanger the life or health of the patient, he would, although no express consent was obtained or given, be justified in extending the operation to remove and overcome them. But such is not the present case. The diseased condition of plaintiff's left ear was not discovered in the course of an operation on the right, which was authorized, but upon an independent examination of that organ, made after the authorized operation was found unnecessary. Nor is the evidence such as to justify the court in holding, as a matter of law, that it was such an affection as would result immediately in the serious injury of the patient, or such an emergency

as to justify proceeding without her consent. She had experienced no particular difficulty with that ear, and the questions as to when its diseased condition would become alarming or fatal, and whether there was an immediate necessity for an operation, were, under the evidence, question of fact for the jury; and they found for the patient."

Second.—"The contention that there was consent by the patient, because she was represented at the operation by her family physician, is not sustained by the evidence," says the appellate court, which goes on to say: "The condition of her left ear was made known to him, and the propriety of an operation thereon suggested, to which he made no objection. It is not urged that he gave his express consent, but that by his conduct he assented to it, and the patient was bound thereby. The purpose of his presence was not that he might participate in the operation, nor does it appear that he was authorized to consent to any change in the one originally proposed to be made. The patient was naturally nervous and fearful of the consequences of being placed under the influence of anæsthetics, and the presence of her family physician was requested under the impression that it would allay and calm her fears."

OPERATING ON CHILD WITHOUT CONSENT OF PARENT

CASE III.—The failure of a surgeon to obtain the father's consent before administering an anæsthetic to his son, seventeen years old, who, in company with adult relatives, applied to the surgeon to have a small tumor removed from his ear, will not render the surgeon liable in damages to the father for the death of the boy while under the influence of the anæsthetic.

The patient was seventeen years old and lived with his father on a farm. He was a large, healthy-appearing youth, but had a tumor on his left ear about the size of a dove's egg. Some time before his death, treatment of the tumor had caused it to nearly disappear; but prior to the middle of February, 1904, it reappeared, and he went to the city of R—— for surgical aid. Accompanied by an aunt and two adult sisters, he went on a Saturday to the office of W., who was a specialist and had practised medicine and surgery a long time. After an examination by W., he was sent to B., another specialist, for a microscopic examination of a specimen from the tumor to determine the character of the growth. The patient then returned to his father's farm. Within a week he returned to W.'s office, accompanied by at least one adult sister, and was told that, from the report of B. on the specimen, it would be best to have the tumor removed by a surgical operation at the hospital.

As to just what was said, the testimony is somewhat conflicting. The sister says that the patient objected to taking an anæsthetic, but was told there was no danger. W. says he told him there was always some danger in taking an anæsthetic, and that he advised him to have the operation performed. On the following Tuesday afternoon the patient, with his aunt and at least one sister, went to the office of W. and was sent from there to the hospital, where they all understood an operation would be performed the following day. In the meantime W. had arranged with A., an expert in the administration of anæsthetics, to administer the chloroform. A careful examination of the heart and lungs of the young man showed them to be normal; and, in the presence of the hospital nurse and the doctors, with the usual appliances for successful operations at

hand, he was put upon the table. A. began to administer the chloroform by means of the mask and the drop method, and had administered about one-third of an ounce, taking from seven to ten minutes to do it, and W. was just about to commence the operation, when suddenly the heart of the patient stopped beating. Every means known to the profession was used to revive the patient; but he was already dead. The father did not know the operation was to be performed.

The trial judge, after hearing the above testimony, directed a verdict for the three physicians; and the appellate court, in affirming the judgment entered thereon, said: "The above testimony, instead of disclosing want of skill in the operation, shows quite the contrary. We have no hesitancy in saying that the trial judge was quite right in saying so when he directed a verdict for the physicians.

"The only remaining question is: Are the physicians liable because they entered on this operation without obtaining the consent of the father?"

It being a case of first impression, no decision of a higher court could be furnished by the counsel of deceased's father, who brought this action. They argued: "It is wrong in every sense, except in cases of emergency, for a physician and surgeon to enter upon a dangerous operation, or, as in this case, the administration of an anæsthetic, conceded to be always accompanied with danger that death may result, without the knowledge and consent of the parent or guardian. It is against public policy and the sacred rights we have in our children that surgeons should take them in charge without our knowledge, and send to us a corpse as the first notice or intimation of their relation to the case."

Passing by the defences interposed by counsel for the physicians, the appellate court said: "The above testimony shows a youth almost grown to manhood, who has been for a considerable time, while living with his father, afflicted with a tumor. It reappears after having almost disappeared under absorption treatment; and he goes up to a large city, and, accompanied by three adult relatives—an aunt and two sisters—submits to an examination, receives some advice and goes back to his father with an agreement to return later to receive the report of the expert who is to make the microscopic examination of the specimen. He returns with at least some of the same adult relatives and arranges for an operation of a not very dangerous character. There is nothing in the testimony to show that, if the consent of the father had been asked, it would not have been freely given. There is nothing in the testimony to indicate to the doctors, before entering upon the operation, that the father did not approve of his son's going with his aunt and adult sisters, and consulting a physician as to his ailment, and following his advice. We think it would be altogether too harsh a rule to say that, under the circumstances disclosed by the above testimony, the physicians should be held liable because they did not obtain the consent of the father to the administration of the anæsthetic."

But this decision has been criticized by the Appellate Court of another State, because the case should have gone to the jury for their finding of the facts. The only excuse, in this view of the case, for the surgeon's course in performing the operation without the father's consent was that, as the boy, after consultation with W., went back

to his country home, presumably to consult with his father, W., by a stretch of imagination, might have concluded that the father was willing that the operation should be performed. But W. should not thus have taken the father's consent for granted. If his inquiry from the boy or his sister disclosed that their father had not been informed of the suggested operation and of the necessity for administering an anæsthetic therefor, W. should, by telephone, telegraph, or personal communication, have obtained the father's consent to the operation as described to him, or, failing this, have refused to perform it. It was not an emergency case.

EMERGENCY OPERATION

CASE IV.—The patient, a boy, fifteen years old, was knocked down by an engine while crossing a railroad track, and was thrown under the wheels of a car, thereby crushing his left foot. There was compound disarticulation of the bones of the foot. The tarsal and metatarsal bones were dislocated, also the two cuneiform bones. The scaphoid bone was torn away entirely. The flesh was crushed and torn from the top of the foot, leaving it covered simply by a few tendons, and the muscular tissues were all gone.

He was partially conscious, upon his removal to a hospital shortly after his injury, and was able to give his name and the street of his residence to the attending house surgeons. But, within ten or fifteen minutes afterwards he lapsed into a comatose condition, and later into complete unconsciousness, and remained so until after the operation, in spite of efforts to revive him by injections of strychnine and infusion of a saline solution. Soon after his arrival at the hospital, at 10.15 A.M., the patient's foot was examined by four house surgeons, who concluded that an operation was necessary and telephoned for the operating surgeon, who arrived at 10.45 A.M., and found the patient unconscious, with a weak pulse and dilated pupils, the foot cold and dead, circulation having been interrupted. The operating surgeon testified that he learned from the house surgeon the boy's name and residence, and knew the time it would take to get from there to the hospital; that he inquired of the house surgeon whether any one, any relatives, were present, and was informed that no person was present whatever. After consultation with the four house surgeons, it was agreed by all that an immediate amputation was necessary to save the patient's life. The foot was amputated and the patient recovered.

The patient sued the operating surgeon and the others for malpractice, basing his action on the claim that his foot should not have been amputated at all, especially without first obtaining his consent or the consent of his parents, who went to the hospital as soon as possible after learning of the accident. On the evidence adduced, the trial judge directed a verdict for the operating surgeon; and, from the judgment entered thereon, the patient appealed.

All the testimony in behalf of the patient amounted to this: That by following a different course the patient's foot *might* have been saved. Although his four expert witnesses disagreed upon some details, they all agreed that the proper course for a surgeon to pursue, when confronted by such an exigency, is to consult

with another or others, and then exercise the best judgment and skill of which he is capable. This was the course followed by the operating surgeon, who, after consulting with the four house surgeons, concluded, with them, that an immediate operation was necessary to save the plaintiff's life. Two other expert surgeons of very wide experience were of the opinion that immediate amputation was necessary to insure the patient's life. It was uncontradicted: That the circulation in the foot was completely interrupted; that the foot was wholly devitalized; that the patient was in condition of profound coma from which the attending surgeons were unable to arouse him; and that death from shock frequently results from severe traumatic injury.

"Taking into consideration the condition in which the patient was when the operating surgeon found him, we have no hesitation," says the appellate court, "in holding that the operating surgeon was amply justified in treating it as a case of emergency, and his conduct should be viewed in the light of the legal principles governing such cases."

That is, in view of the facts, the court eliminated the question of negligence and confined the issue to want of consent; because, in actions for negligence, the fact that the surgeon acted according to his best judgment is no defence, inasmuch as his act is to be judged by a standard, and that standard is the act of an ordinarily prudent and qualified surgeon under the circumstances. But conduct resting upon judgment, opinion, or theory is distinguished and tested by a different rule. The distinction has been pointed out and well expressed as follows:

"The distinction between an error of judgment and negligence is not easily determined. It would seem, however, that if one, assuming a responsibility as an expert, possesses a knowledge of the facts and circumstances connected with the duty he is about to perform, and, bringing to bear all his professional experience and skill, weighs those facts and circumstances, and decides upon a course of action which he faithfully attempts to carry out, then want of success, if due to such a course of action, would be due to error of judgment, and not to negligence. But if he omits to inform himself as to the facts and circumstances, or does not possess the knowledge, experience, or skill which he professes, then a failure, if caused thereby, would be negligence."

Squared by this principle, and upon the facts of this case, "It is very clear," says the appellate court, "that the question presented to the surgeon was one of judgment only. Instant action of some sort was imperative. In reaching a conclusion as to the proper course to be pursued, the attending surgeon must necessarily be influenced by many considerations: The physical character of the wound, the fact that there was compound dislocation of the bones of the foot, the entire absence of one of these bones, the stripping off of the flesh from the anterior part of the foot, leaving the tendons bare and shiny, the fact that the foot had become wholly devitalized, the presence of hemorrhage, the danger from blood-poisoning at the time or from future infection, the character and quantity of foreign matter, dirt, cinders, and the like, in the wound. To a consideration of these matters must be added a careful attention to the general condition of the patient, the degree and cause of the existing shock, the apparent ability or inability of the patient to resist shock, the condition of the temperature, pulse, and respiration, and the reaction, or lack of it, produced by the administration of stimulants. Called on to act under such circumstances and to determine which of two courses (one entailing certain mutilation, and the

other probable death to the patient) should be followed, it is apparent that the surgeon is not bound by the ordinary rules of negligence, but is entitled to insist that, having used his best judgment, he is not liable."

The surgeon testified, and was not contradicted, that he made inquiry for relatives of the patient, and was told that none were in the hospital. "Suppose," says the appellate court, "that his informant was in error (which is not certain), the surgeon had a right to rely on the information and to act in the emergency upon the theory that to obtain consent was impracticable."

"It is inconceivable," adds the appellate court, "that the consent of the parents to the operation, even if they had been present at the operating table, would have been refused, in the face of the determination of five duly qualified physicians and surgeons that such operation was necessary to save the boy's life."

As further extenuating considerations in emergency cases, the appellate court went on to say: "The fact that surgeons are called upon daily, in our large cities, to operate instantly in emergency cases in order that life may be preserved, should be considered. Many small children are injured upon the streets in large cities. To hold that a surgeon must wait until, perhaps, he may be able to secure the consent of the parents before giving the injured one the benefit of his skill and learning, to the end that life may be preserved, would, we believe, result in the loss of many lives which might otherwise be saved. It is not to be presumed that competent surgeons will fail to obtain the consent of parents to operations where such consent may be reasonably obtained in view of the exigency. Their work is highly humane, and no rule should be announced which would tend in the slightest degree to deprive sufferers of the benefit of their services." And the judgment of the lower court directing a verdict for the surgeons was affirmed.

Miscellaneous

MEDICAL ILLUSTRATION

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If we compare the artistic illustrations in popular magazines, story books, and newspapers with the amateurish pictures in many of our medical publications, we wonder why the artistic progress of the world has not included medical illustrating also. There are two distinct shortcomings found in medical pictures. The average medical illustration is incorrectly drawn and without sufficient knowledge of the principles of light and shade on the part of the artist. The illustration is also usually lacking in scientific accuracy, in regard to anatomical facts as well as conception of the picture. The picture does not clearly convey the meaning of the author. It often obscures instead of elucidating the text.

The artistic inadequacy has its cause in the unfortunate fact that the majority of medical illustrators are inferior or insufficiently trained artists. An artist who has failed to make good in the so-called higher branches of art—portrait, landscape, and figure painting and drawing—is also unfit for medical work. Many talented artists have a notion that medical illustration is beneath them; they rather spend their youth in a garret painting pictures that no one cares to buy than offer their services to medical art. They are in error when they think that there are no artistic possibilities in medical illustration. Beauty of form and contour is not confined to the exterior of the body. Composition of tonal effects in an anatomical or surgical picture is fully as interesting as in a figure painting. The forms of minute anatomy (histology and pathology) are just as fascinating to the eye as our time-honored motives in decorative art.

It is to be hoped that in the future a greater number of genuinely gifted art students will volunteer to offer their services to medical art. I shall be glad to place my time and experience at their disposal, provided they are enthusiastic and willing to make medical illustrating their life's work. The chief requirement is careful draughtsmanship, a tendency toward accuracy in small detail, and a finely-developed sense for form and surface structure. I should add to that a high degree of intelligence, for, as I shall show presently, the medical illustrator must be able to grasp the problems of medicine. He must study anatomy and pathology before he can interpret and illustrate medicine and surgery. It is also necessary to make the novice feel that the remuneration will be commensurate with his enthusiasm, his ability, and energy. I have found a widespread belief among artists that from a monetary standpoint it is not worth while to spend years in additional study in order to equip themselves for the work. I think they are wrong, and I believe the medical profession will prove to them that they are.

The scientific inadequacy of medical illustrations has its cause in the inability of the average artist to fully comprehend the subject. In order to be successful he must possess knowledge and skill wholly different from that needed by his brother artist who paints things with which he has been familiar ever since his childhood days, *viz.*, people, trees, rivers, sky, etc. Such things he can interpret and draw, because his critical judgment of their form and significance is highly developed through years of observation. The medical illustrator, on the other hand, is not familiar with the things he draws. Medical objects convey little meaning to him. Often he regards them even as repulsive, and therefore avoids original study, the only road to success. To be just, however, I should add that frequently he has had no chance to study. Medical illustration in its highest form is interpretative: it means an accentuation of the essentials and an omission or suppression of the unessentials, the superfluous. This, I believe, is possible only if the artist completely understands the meaning of the object. Not until then can he hope to obtain the clear mental image which he needs as a guide in his drawing. The degree of vividness of this mental picture determines the value of the subsequent picture on paper, both in regard to conception and execution. If, before he starts the drawing, the artist knows precisely what his

picture should look like when finished, he can select with wisdom his paper and his technic: there is no experimenting and no waste of time. Eye and hand work in unison with far greater precision if dominated by a clear mental image acting as a guide throughout the work.

It is therefore evident that the medical illustrator must study the elementary branches of medicine; he must dissect and draw the human body *in toto* and in the form of frozen sections. He also has to study fresh tissues at autopsies and learn to interpret pathological specimens before he can hope to represent medical and surgical conditions.

The dissatisfaction among medical writers with the illustrations made by incapable artists is, I believe, widespread. I wish it were still more so, for then contemporary medical literature would be spared many an example of puerile plagiarism. We must not only educate artists to do better work, but also prove to the medical profession that the rejection of faulty pictures is a service rendered to medicine.

The scientist who commissions an artist to illustrate his paper or his book usually knows exactly what he wants. He has worked for weeks, months, or years over the matter; he has worked with eye, hand, and brain, and in *his* mind is the precious conception which would crystallize itself into a picture without undue effort if he only could draw. If he can do so, we have indeed a rare combination, one that has given to medical literature some of its best and truest pictures. The medical illustrator usually gets his conception second-hand, so to speak, through the explanations of the scientist. Such explanations can never be very vivid, even though the scientist be a master teacher. The artist cannot see with the scientist's eyes. He must make his own studies after the pattern of those of the scientist. To make pictures from descriptions is fatal, unless the artist has a vast experience in original study. More ideal conditions are approached if the artist is permitted to be the scientist's helper during the latter part of the study. The best basis for a medical illustration is independent original study by the artist. For instance, an operation is best illustrated by an artist who has not only witnessed it several times at close range, but who with his own hands has duplicated it on a cadaver. During such studies pictures are born in the artist's mind, clear, graphic pictures, which mean that half the intellectual part of the

work, all the planning, has been completed before the hand reaches for the pencil. It actually amounts to a saving of time.

This shows that the making of all medical drawings should be preceded by a thorough *study of the object* with eye and hand. Tactile examination is fully as important as visual examination, and the artist should get the benefit of this practice before and during the making of the picture. Let the left hand rest on the object while the right draws. Our sense of vision, in order to become more perfect, has to be supplemented by our sense of touch. During the drawing of a dissection or an autopsy the left hand poses the various structures one after another so as to reëstablish their true topographical relationship to each other and to the whole. In drawing a hardened specimen the hand often recognizes texture which the eye had failed to observe. Even in microscopic drawings it is a great help if the artist has seen and handled the gross specimen from which the block has been cut, also the block itself. The orientation of the various forms on the slide then becomes much facilitated. Cell masses and cavities as seen under the microscope receive in this manner a new significance, which is of benefit in the making of a true and interpretative drawing.

But the study of the object is by no means the only requisite, for the failure of a medical drawing may at times be entirely due to the faulty *posing of the object.* We must remember that, while our impressions of nature are the result of binocular vision, a picture is a view as revealed by monocular vision. The result of binocular vision, especially at close range, as all medical drawings must necessarily be done, can never be shown in a picture. The artist must recognize that fact and plan his work accordingly. Binocular vision is always highly plastic, even without careful posing of the object and without definite illumination, while a one-eye view of the same object will appear like a chaos of obscure structures. Since we cannot show two pictures in one, we must make that one picture as plastic as we can. This is done by judicious posing of the object in regard to the source of light. The most important feature of the object, the one which justifies the making of the picture, should be illuminated so as to make it also the dominant feature of the illustration. It is the focus of interest from a scientific standpoint, and should therefore also be the spot in the drawing toward which the reader's eye should first be attracted. The posing will do that. If the object appear

intelligible as viewed with one eye only, the task of drawing it will be simple. If, on the other hand, a one-eye view gives an obscure, unintelligible view of the object, no artist, not even the best of them, can make a respectable plastic drawing of it.

A complex object can rarely be posed perfectly under one light so as to illuminate each square inch of surface ideally. It is then the artist's privilege to pose each obscure portion separately and draw it under the best light obtainable in order to represent its characteristic form in an unmistakable manner. Little shadows are thrown over unduly prominent light surfaces, or reflexes introduced where the shadows appear undifferentiated. Of course, the general direction of the light must remain the same, preferably from the upper left, and after the entire drawing has thus been completed by piecemeal illumination the masses are toned together so as to maintain in the finished picture the impression of a uniform illumination. It is in this manner that an artist can produce remarkably clear and plastic pictures.

Another question the artist should carefully consider is the *selection of the viewpoint.* The operator obtains his impression of the operation by getting hundreds of views of the different structures from as many angles. The artist must pick out those that permit of the clearest representation of the dissection or operative procedure. Many steps cannot be shown by a view through the wound, but must be reconstructed by basing the drawing on frozen sections, either coronal, transverse, or sagittal. The artist must decide whether the picture of the procedure be more intelligible to the reader with the patient imagined in the erect posture instead of in the recumbent or upside down, as in Trendelenburg's posture. I cannot recognize the features of my best friend if viewed upside down. For the same reason it is inadvisable to render forms and topographical relationships obscure by presenting them in unusual postures. Directness of effect and clearness in treatment should be the principal virtues of a classic medical picture. Everything that is obscure, fragmentary, or insufficiently oriented by landmarks proves a puzzle to the reader. He wastes mental effort trying to unravel the mystery of such a picture, and often passes on without having fully grasped its meaning. It is a waste of time and money to print such pictures.

The *purpose* of a good medical illustration, I believe, should be

the clearing up of a point that cannot well be made by the text. A picture gives a maximum of information in a minimum of time. The reader furnishes his own description of the picture, and while doing so visualizes the procedure with more or less clearness. Experience teaches that pictures are remembered far easier than words. Any medical student can testify that anatomical facts are much more permanently impressed upon his memory if based on pictures, while if based on words they vanish quickly from his mind. It is therefore proper to regard medical illustration as a necessary part of medical progress. The same cannot be claimed by popular magazines and story books, in which pictures must be considered more or less of a luxury.

One of the highest virtues of medical illustration is its great value in medical research. The picture here is only a means to attain the end, for it is not the drawing itself that is wanted so much as it is the information and the stimulus obtained during the process of making it. Research in many of its forms is close observation coupled with sound reasoning, and no practice fosters both better than that of drawing or sketching. A description is apt to pass over obscure portions of an object in silence, but a drawing or a sketch could not well contain white patches in place of the unknown. The research worker is compelled to give an intelligent account of every feature presented, and thus he frequently stumbles upon problems and perhaps also their solution while making a drawing or a sketch.

It is to me a noteworthy fact that many of the best research men I have known were also men highly gifted in the art of drawing. Among a class of one hundred medical students I find, on the average, five who draw splendidly and without effort. It is significant that these five usually also rank very high in their medical work. This has been my experience during the past eight years. I do not wish to state, however, that all brilliant students have artistic skill, for there have been some notable exceptions.

The foregoing brings us to the question: Can and should the scientist do a certain type of medical illustrations himself? I can answer that question in the affirmative. There are two classes of medical illustrations. The first is that of simple pictures in which the scientific element vastly predominates, while the artistic requirement is such that a few weeks of practice will render the research

worker capable of making his own drawings, or at least the sketches. I refer here to problems in anatomical and embryological research and experimental work. A primitive sketch by the author is here far truer than an elaborate picture done by an artist. In such cases it is therefore a short cut to success to train the scientist to draw rather than make a research worker out of an art student.

The second class of medical pictures lies nearer the domain of the artist; *i.e.,* the requirements are sound draughtsmanship, technical skill, and artistic feeling. The bulk of medical pictures are of this class, and it is necessary to commission an artist to do this sort of work.

During the past eight years I have endeavored to teach to scientists the principles and practice of scientific illustration, and to artists and art students the medical knowledge so essential for a successful career as a medical illustrator. However, not until the spring of 1911 had it been possible for me to devote a large part of my time to this work. It was through the untiring efforts of my friend, Dr. Thomas S. Cullen, that it has been made possible to start a foundation at the Johns Hopkins University for the purpose of creating a department known as "Art as Applied to Medicine," and designed for the needs of two classes—one for medical students and research workers, and the other for art students and artists. It was realized that all medical illustrators of the present day are self-taught men and women. They are left to their own resources, struggling along a difficult road, encountering many failures before attaining a measure of success. Much of their time is wasted with tedious experimenting on paper. Several of the best have recently died without an opportunity of training a successor, their precious experience having been buried with them. It is a recognized fact that no science or art can ever develop to a high degree of perfection unless a new generation can base its methods upon the work of the last generation and thus profit by the failures and successes of their predecessors.

I consider it my duty to do my share in bridging over the gap existing between art and medicine, and to help train a new generation of artists to illustrate the medical journals and books in the future and to spare them the years of trial and disappointments of their self-taught predecessors.

I close with a brief summary of the course of instruction I have followed.

1. The *medical students* begin by making careful, realistic charcoal and crayon studies of bones, which teaches them accurate draughtsmanship and also the principles of light and shadow as a means of obtaining plastic effects. The next step is the study of line drawing as a basis for rapid sketches. Such sketches are made of anatomical models and anatomical and pathological specimens in black and white or in color. Special instructions are given in microscopic drawing. Finally, the student is taught one or several technics suitable for the modern methods of reproduction.

2. The *art students* begin by making careful artistic studies of the skeleton. Then they systematically dissect the human body. Every region is sketched or drawn actual size in crayon and colored pencils during the different stages of the dissection and from various angles. Then the entire body is again studied topographically by means of frozen sections. These drawings and sketches are also made with crayon and colored pencils, and are profusely lettered and labelled. In his portfolio of sketches the artist possesses a most valuable storehouse of knowledge. Many a simple sketch may, years later, form the basis for an elaborate drawing. In order to accustom the eye to fresh tissues, studies are now made from autopsies and animal material. The student injects the blood- and lymph-vessels of fresh organs so as to appreciate the character of living tissues. He finally studies histology, for nothing trains the eye better to appreciate surface structure or the character of a cross-section of an organ than the knowledge of minute anatomy. Hardened pathological material is next studied and sketched. This teaches the student the interpretation of specimens and the correct attitude of the illustrator toward such problems as cause and effect in disease, various degrees of a pathological process, and the expression of texture of tissues. The art student is now ready to understand the medical and surgical clinics and learn the pictorial representations of the various types of examination, treatment, and operation.

Since the impressions at the bedside and the operating table are too fleeting for careful study of such accessories as the external form of the body, instruments, dressings, draperies, gloved hands, etc.,

separate studies of such detail are made on living models hired for the purpose.

Parallel with and supplementing the various anatomical, pathological, and surgical studies are instructions in the technics employed in medical illustrations. The artist is also made familiar with the modern methods of photomechanic reproduction so as to render him capable of judging what type of drawing yields the best picture on the printed page. During his two years of medical study an art student finds time to do a number of finished drawings, which are reproduced and used in various scientific papers and books, thus giving him an introduction into the practical side of medical illustration and preparing him for what he must regard his life's work.

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